„COSTS OF CASH AND CASHLESS PAYMENT INSTRUMENTS IN GERMANY“

COST COMPARISON BETWEEN CASH, DEBIT CARDS AND CREDIT CARDS AND POTENTIAL COSTS SAVINGS

PAYSYS CONSULTANCY

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List of abbreviations

APACS	Association for Payment Clearing Services
ATM	Automated teller machine
C&S	Clearing and Settlement
CIT	„Cash in transit" companies
Credit	Credit cards (revolving credit or charge cards)
Debit	Debit cards (with or without payment guarantee)
DSGV	Deutscher Sparkassen- und Giroverband (German Savings Bank Association)
ECB	European Central Bank
EHI	EuroHandelsInstitut
ELV	Electronic direct debit system at the POS (without guarantee)- „*Elektronisches Lastschriftverfahren*"
EPC	European Payments Council
HW	Hardware
LZB	State Central Bank - Landeszentralbank
NT	Night deposit – *Nachttresor*
OTC	Over the counter
p.a.	per annum
p.c.	per capita
p2p	person-to-person
PIN	Personal Identification Number
POS	Point of Sale
POZ	Electronic direct debit system at the POS (without guarantee)
Resource costs	includes all factor input („real resources" – incl. time); does not include payments between the sectors and does not include externalities (black economy etc.)

SS	Self Service
SEPA	Single European Payments Area
SW	Software
Tx	Transaction
ZKA	Central Credit Committee of the German banking associations - *Zentraler Kreditausschuß*

1 INTRODUCTION

Over the last couple of years, payment transactions have continuously been moving into the focus of public attention. The European Commission finds fault with inadequate integration of payment transactions in Europe, several Central Banks criticise present inefficiency of existing systems. Guardians of competition are critically investigating the applicable rules, and almost everyone involved (consumers, retailers, banks, etc.) complains about high costs.

Especially cash has been criticised, mostly for cost and efficiency reasons. Criticism is mainly based on a cost estimate conducted by the European Payment Council (EPC) according to which cost of cash amounts to about EUR 50 billion for banks (including Central Banks) and retailers. Facing such a high amount usually results in demands expressing stronger propagation of payment cards in order to reduce the cost of payment transactions, a demand naturally and vehemently supported by credit card companies like MasterCard and Visa. They have proclaimed a "War on cash" and are working hard to gain widespread acceptance for their products. On the other hand, cash-like products, e.g. prepaid cards and contactless cards, are currently rated as potential competitors able to supersede cash payments. The credit card campaign is supported by a series of analyses aimed at corroborating the low costs attributed to credit card payments and their positive impact on overall economic growth.

But a comparison of cash payments versus card payments has to focus on the specific advantages of the two products for the individual user. Unlike a purse, debit cards and credit cards do not have to be replenished with cash and therefore provide a high amount of liquidity and convenience to card holders. As all transactions are itemised in the invoice, card holders can trace all transactions s and file them, if they want to. And finally, card holders are normally well protected against abuse of their cards. Cash has advantages, as well. Cash payment is an ingeniously simple method, almost any person, whether young or grown, is intuitively capable of understanding and mastering. Facing an increasing average age of the population, simplicity becomes important, since the process of ageing will still be accompanied for many people by growing obliviousness

and a general decrease of mind power. This implies that even experienced card users may rather rely on cash when getting older. Many people consider cash as suitable means to manage their spending habits. If somebody wants to limit his spending for one evening to 50 EUR, all he has to do is take 50 EUR in cash – and no payment card.

One should not underestimate the high amount of flexibility cash provides, more than any other payment instrument. Cash can be integrated in processes quite strongly automated, but also works without any technical infrastructure present, making it the perfect means of payment for person to person transactions (p2p), which pose a problem to most credit card systems. Cash is also very flexible with regard to the amount to be paid.

Cash is traditionally considered to be an instrument for small-value payment – a fact that is true for convenience and speed of transaction in the range of small amounts. Yet there are many fields which demand the payment of rather high amounts (from the customer's point of view), e.g. when buying a used car. In most of these cases, there is no alternative to cash payment.

Of course, it cannot be denied that cash is also a suitable means for doing illegal business and subsequent „laundering" of collected money. Cash is also often used in committing tax fraud. These aspects, however, should not result in a general condemnation of cash. On the one hand, there are also several ways of using cashless payment instruments for performing illegal transactions. On the other hand one should not forget that, after all, only cash provides the ultimate protection to an individual's "financial privacy". Keeping in mind that, in some countries, government may monitor activities in their citizens' bank accounts, this aspect is gaining importance. Or – putting it in the words of a former member of the Monetary Policy Committee of the Bank of England – a completely account-based payment system in which the government was able to trace all transactions would truly resemble an „Orwellian nightmare".

Facing public discussion on the features of an efficient payment system and facing the enormous economic importance, the present study intends a sound estimate of the cost of cash, debit cards and credit cards in 2004. The estimate is based on the costs of four

sectors: households, retailers, banking sector and Central Bank. The survey is not primarily targeted at estimating sectoral costs but at the social costs. This is why all payments which are debited to one sector and credited to another (fees, invoiced services, etc.) are excluded. The amount then obtained represents the social costs resp. the expenditure in terms of economic resources.

If the costs of payment transactions are considered in the broad sense, even such costs like facilitating underground economy and others would have to be included. These costs, however, are hard to determine, since it is neither clear how large the underground economy is nor is there an agreement on the question whether it has to be considered as harmful. Any assumptions in this respect must also consider that cash is not the only means for completing illegal transactions, but that there are alternatives. Thus, if and to what extent currency promotes underground economy activities and which social costs are incurred, is not treated in the present survey. **Therefore, in the following, the term "resource costs" will be used to indicate that not all social costs are included.**

Absolute costs are hard to compare. They have to be related to "output". In payment systems, the number of transactions and volume of transactions seem appropriate measures of output. Estimates for both parameters are gained rather easily as regards card payments, whereas a lack of statistical material has to be faced with regard to currency. In particular, this applies to person-to-person payments which are meant to be included in the survey. The present study thus provides an essential contribution to the current discussion by estimating the number of cash transactions and the respective volume.

2 SUMMARY OF RESULTS

The present study shows that both payment methods, cash and card payment, cause considerable resource costs. In Germany, they amount to **about EUR 10 billion or almost 0.5% of the gross domestic product,**[1] a value roughly corresponding to a per capita value

[1] This value does not include costs involved in actually making the payment at the POS in terms of time required by cash register attendant and customer. In this respect, the present survey follows

of EUR 121. The transaction costs amount to an average of EUR 0.25, about 1.1% of the transaction value.

Table 1 Resource costs of POS payments (excl. cashiering costs)

	Costs (€ mn.)	EUR per Tx	in % of Sales	in % of GDP	EUR per capita
Cash	8,285	0.22	1.10%	0.38%	100
Debit	817	0.44	0.72%	0.04%	10
Credit	916	2.35	2.66%	0.04%	11
Total	10,017	0.25	1.12%	0.46%	121

The **lion's share of costs is incurred by cash payments,** with more than EUR 8 billion it accounts for 0.38% of the gross domestic product or EUR 100 per capita. Costs for debit and credit card payments amount to EUR 800 resp. EUR 900 million, corresponding to 0.04 % of the gross domestic product and EUR 10 resp. EUR 11 per capita. The enormous difference is mainly due to a significantly smaller number of card transactions. **The number of cash transactions is estimated to a minimum of 37.5 billion**, the pertinent turnover to EUR 750 billion. The estimate of the number of transactions is more uncertain than the estimate for the turnover. On the other hand, the **number of card transactions with a total of about 2.2 billion** is significantly smaller. The same holds true for the payment volume involved with approx. EUR 150 billion.

Table 2 POS retail payments: Transactions and turnover

	Tx mn.	EUR bn.	EUR per Tx	Tx per capita	EUR per capita
Cash	37,500	750	20	455	9,091
Debit	1,840	113	62	22	1,376
Credit	390	34	88	5	418
Total	39,730	898	23	482	10,884

the practical standard of most other studies. Exclusion does not affect relative costs for card and cash. (Since these costs may be very important for some aspects of retail business, the annex provides an estimate including cashiering costs.)

If costs are related to the number of transactions, cash turns out to be the payment instrument with the lowest average cost (EUR 0.22) per transaction.[2] Costs for debit cards amount to EUR 0.44 per transaction, for credit cards even to EUR 2.35 per transaction. If costs are expressed as percentage of the payment value, the picture changes: Due to the low average value of cash payments, the pertinent costs climb to 1.11%, whereas the costs for debit card payments remain low with only 0.72%. The credit card is the most expensive payment instrument in this case as well with a percentage of 2.66%.

There are no ideal parameters available for the evaluation of payment transactions. Yet the most influential cost driver for almost all small-value payments is the number of transactions. Though the transaction value contributes to the costs, the quantitative effect is usually limited. This is the reason why a perspective regarding „**cost per transaction" is the preferred benchmark.** In this respect, **cash payment is the most cost-efficient transaction**.

Table 3 Allocation of resource costs to sectors (excl. cashiering costs)

	Cash	Debit	Credit	Total
Retailers	3,193	507	201	3,902
Banks	3,982	307	715	5,003
Hausholds	232			232
Bundesbank	889			889
Total	8,296	814	916	10,026

in million EUR

The biggest share of resource costs (EUR 5 billion) is accounted for by banks. The retailers' share amounts to EUR 3.9 billion[3] and the Bundesbank has expenditures of less than EUR 900 million. Household expenditures amount to only EUR 232 million. These figures simply illustrate where costs are incurred, but they are not costs in the sense denominating payable sums. For example, retailers pay fees to banks, and the Bundesbank has revenues in the form of interests on interest-free cash money coming from the other three sectors.

The estimate for costs of cash incurred by the banking industry ranges far below the estimate conducted by ZKA. In 2004, the ZKA published a „National Cash Plan" giving an es-

[2] Estimation of number of transactions is liable to considerable uncertainty. An increase in numbers will in due course result in a corresponding reduction of cost per transaction.

timate of EUR 6.5 billion. But the PaySys estimate is roughly comparable to an estimate recently published by DSGV.[4] **DSGV estimates that savings banks incur costs for cash amounting to about EUR 2 billion.** Savings banks have a market share of approximately 50% in terms of accounts, resulting in a projected total of EUR 4 billion for the national economy – exactly the sum that was determined by the present survey.

The currency cycle offers **tremendous savings potentials**. First of all, there are costs incurred by depositing or withdrawing cash over the counter (OTC). Enormous savings can be achieved by **shifting counter transactions to customer-operated machines**. A model calculation based on a 50% reduction of counter transaction volumes (with a simultaneous decrease in transactions by 75%) yielded an **estimated cost reduction of almost EUR 1 billion**, corresponding to roughly 25% of costs incurred by the banking sector.

Many banks still have their employees perform jobs like ATM replenishing and cash handling. It can be assumed that intensified **outsourcing** will open up considerable efficiency potentials, in particular for processes like ATM replenishment, disposition, handling of deposits (incl. night depository). The present survey, however, does not allow a quantification of these potentials.

Since a bank's cash inventory is not taken into account with regard to the minimum reserve balance, banks are better off keeping their cash inventory as small as possible, an approach that implies rather high transportation costs. **If cash inventories could be deducted from required reserves** a net reduction in costs could be achieved – i.e. after deduction of costs for increased risk – **of about EUR 60 million incurred by transportation and replenishment**. In periods of higher interest rates savings would be even higher.

Retail companies differ enormously with respect to structure and size, a fact that makes it almost impossible to reliably determine potential savings. One factor that will definitely gain importance for sectors with high transaction volume is the implementation of **self-**

[3] Retail business in the broader sense: incl. gas stations, hotels, restaurants, etc.
[4] Kreutz, Paul und Thomas Schaumlöffel (2003): Optimiertes Bargeldmanagement als strategische Kostenbremse, Betriebswirtschaftliche Blätter 11/2003, S. 544 – 547.

checkout systems. These systems promise a significant decrease in costs incurred by the cashiering process. Further cost reduction can be achieved by **automation and optimisation in giving change.**

Shortening the cycle of cash circulation is one important point to start from when reducing the costs for cash. Shortening the distance between depositing and disbursing will also reduce transportation costs and diminish multiple repetitions of the same processes. This requires admitting cash to be filled into cash dispensers that was not verified by the Bundesbank in advance. Possible solutions are: **currency verification in private cash centres, verification at the branch, use of recyclers, recyclers used by retailers** (ATMS replenished by merchants). Dispensing cash at the shop's cash register (**cash-back**) can also reduce costs.

It is frequently assumed that the average cost for cash payments is lower than the average cost for card payments, but that marginal costs of cash payments are higher. Confronted with considerable data problems, the present survey has refrained from breaking down fixed costs and variable costs. **Yet many aspects hint at a smaller share of variable costs in cash payment than it is generally assumed.** This share is continuously falling due to currently growing automation. On the other hand, variable costs of card payments are frequently underestimated since people tend to ignore that card payments are not merely made viable by technical infrastructure but also require competent customer service. **Any estimates predicting enormous savings potentials in resource costs after substituting cash payment by card payment have to be viewed with utmost scepticism.**

3 CAMPAIGN AGAINST CASH

During the last years, criticism of cash has been growing steadily with critics coming from different camps:

1. Credit card companies increasingly tend to view cash as their main opponent simultaneously trying to place their own products as the more efficient alternative. They follow a two-track policy: On one hand, they try to make cards more palata-

ble to banks as profit-bearing payment instrument. On the other hand, public discussion is influenced by means of surveys intended to make people believe that cash is causing considerable resource costs. To push that matter, VISA and the consultants of GlobalInsight have published a survey[5] in which they arrive at the conclusion that a growing use of cards will result in enormous cost reductions and growth effects. Credit card organisations pursue an aggressive strategy for promoting their own card-based payment products. As the president of MasterCard Europe put it in an article: „What is the essence of SEPA? I believe that SEPA is all about winning the ‚War on Cash' in Europe." [6]

2. Central Banks, a number of scientists and some competition authorities have identified pricing practices for payments as reasons for inefficiency. They suppose that cash dispense free of charge (by ATM or at the counter) influences the preferences of payers. If we follow that argument, we must assume that cash is used too often and other payment instruments - subsequently - too rarely. An efficient pricing of payment instruments is intended to eliminate this "deficiency". In line with this argumentation, Central Banks of some countries exert pressure on banks to price their payment services in true relation to the costs. The Netherlands, for example, saw the foundation of the „National Forum for the Payment System", an institution analysing the cost of payment transactions, that finally arrived at the conclusion that debit payments and electronic purses are cheaper than cash payments. This is the reason why card payments are pushed in the Netherlands.[7] In Norway, the Norges Bank insisted on introducing cost-based prices for payment transactions. The bank

[5] Visa International and GlobalInsight (2003): 'The Virtuous Circle: Electronic Payments and Economic Growth', http://www.visaeurope. com/howvisaworks/pdf/The%20Virtuous%20Circle.pdf

[6] See Labak, Alexander (2005): SEPA: The Future Beyond Cash - Europe's Debit Alternative, Speech to Delegates of Fourth Annual MasterCard Debit Conference, Geneva, March 10, 2005.

[7] See National Forum on the Payments System (2004): The Costs of Payments. Survey on the Costs Involved in POS Payment Products, Working Group on Costs of POS Payment Products, March 2004.

argues to have initiated a more efficient payments system.[8] Among those arguing for replacing cash by card is the European Central Bank. For example, Gertrude Tumpel-Gugerell (Member of the ECB directorate) addressed banks in a recent speech to take appropriate actions for achieving that goal: „You will be even more successful if you create a SEPA (Single Euro Payments Area) for cards in a reasonable time frame and if you succeed in that the use of cash should be less prevalent than it is now.“ [9]

3. During the fight against money laundering and the underground economy cash has been put in the line of fire. Politicians, supervisory authorities and scientists view cash as an essential tool in money laundering and conducting illegal transactions. In particular high cash inventories of bank notes with high denominations are eyed suspiciously in this context. The possible use of these bank notes in underground economy is what prominent US economist Kenneth Rogoff had in mind when he criticised issuing a 500 EUR banknote before the introduction of the EURO.[10]

4. Banks are under increasing pressure to reduce costs. So they look at their (allegedly) deficit-ridden involvement in the payment system. It is often assumed – with generally no empirical basis at all – that in particular cash handling causes exceptionally high costs. Based on this assumption, they first demand more efficiently organised cash handling. And secondly, they call for a stronger support of cash substitutes. These stipulations have for example been embraced by ZKA (Central

[8] Gresvik, Olaf and Grete Øwre (2003): Costs and Income in the Norwegian Payment System 2001. An Application of the Activity Based Costing Framework, Norges Bank, Working Paper 2003/8, September.
[9] Tumpel-Gugerell, Gertrude (2006): A SEPA for cards: a contribution to a cashless society?, Speech by Gertrude Tumpel-Gugerell, Member of the Executive Board of the ECB, EFMA Cards and Payments Conference Paris, 20 September 2006.
[10] See Rogoff, Kenneth (1998): Blessing or Curse? Foreign and Underground Demand for Euro Notes, Economic Policy, April, 263-303.

Credit Committee of the German banking association) and EPC (European Payment Council).[11]

4 EXISTING SURVEYS ON COSTS

Estimates on the resource costs of payment transactions are prone to significant uncertainties rendering it valuable to compare the findings with those of other estimates. Most estimates refer to the banking and the retail sector. In general, their findings are not based on resource costs but on the total cost of the sector (incl. fees etc.).

4.1 COST OF CASH IN RETAIL BUSINESS

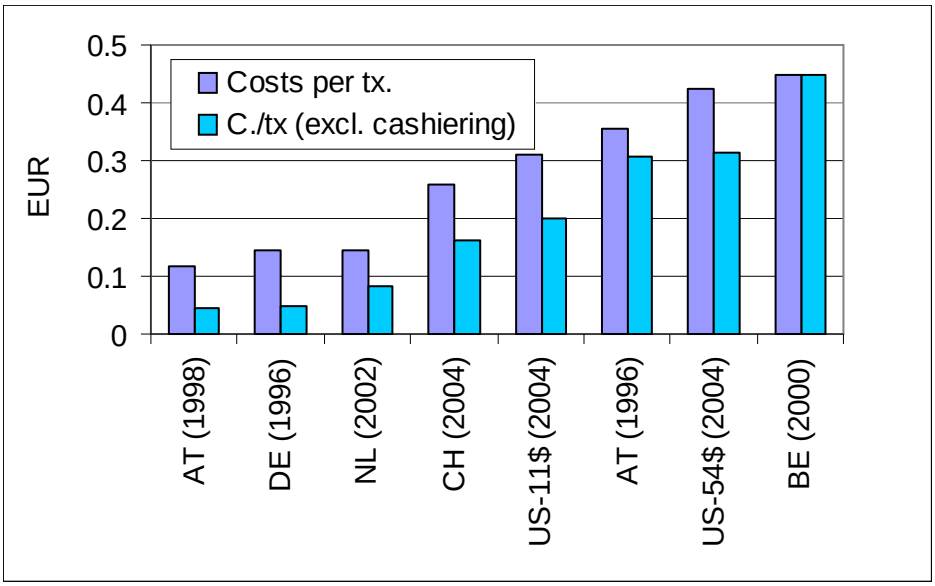
Studies on the cost of cash used in retail business are available for a number of countries:[12]

- Belgium
- Germany
- the Netherlands
- Austria
- Switzerland
- the United States

Figure 1 Estimates of the costs of cash incurred by retailers in 6 countries

[11] See National Cash Plan, DSD – Der Sicherheitsdienst, 2/2004, S. 14 – 18 and European Payments Council (EPC) (2003): Cash Working Group Summary of Findings & Recommendations, Brussels, DOC EPC-0165/03, 28.3.2003. The ZKA provides a platform for banks in Germany to make collective decisions on a number of issues – incl. payments.

[12] See De Grauwe, Buyst and Rinaldi (2000b), Garcia Swartz, Hahn and Layne-Farrar (2004b,c), Hoofdbedrijfschap Detailhandel (HBD) (2002), Schaub and Spichiger-Carlsson (2004), Schnedlitz and Waidacher (1996), Trcka (1998), Zellekens and Rüter (1996).



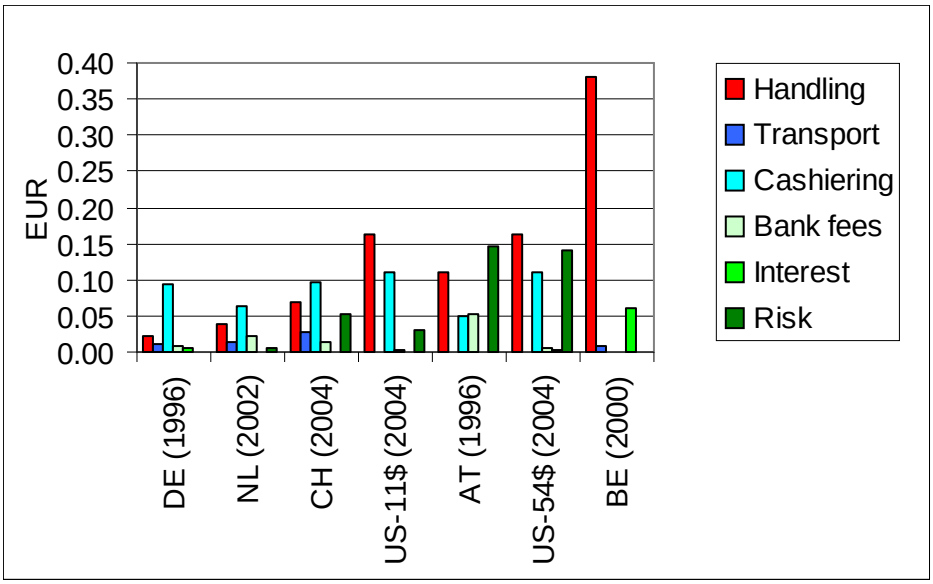
The annual figures refer to the year the respective study was published.

Calculations of cost per transaction differ widely. Estimated costs per transaction range from a mere 12 Cent in Austria to a maximum of 45 Cent in Belgium. If the costs for the cashiering process are excluded, costs range between 5 Cent per transaction (Germany, Austria) to 45 Cent in Belgium.

Taking a look at the various components of costs makes it clear that the differences are caused by deviating frameworks, assumptions and data collection periods.

The most important differences arise with respect to the estimates of the costs of cash. These include filling the cash register (resp. emptying) and counting, sorting, preparing etc. These processes mainly lead to personnel costs. Additional service fees have to be added in case of external service companies, but the fees are rather transparent. Problems originate from estimating internal personnel costs. This is why the differences do not necessarily reflect actual differences in costs but rather deviations in the assumptions on which the estimates are based.

Figure 2 Structure of costs of cash incurred by retailers in 6 countries



Bigger deviations can also be found in terms of risk costs, which may cause problems in estimates. Such differences, however, can be explained rather easily since there are international differences in risks. The Secretary General of the European Security Transport Association for example pointed out that 700 hold-ups occurred in the UK in 2003, whereas none were registered during that period in Austria, Finland and Luxemburg. The number of hold-ups in Germany is 12-13 per year.

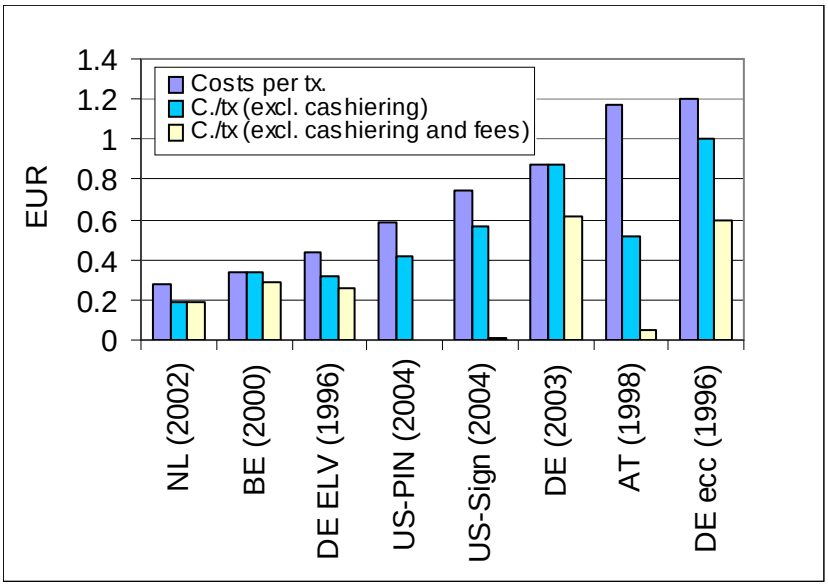
The differences are less important when considering the costs for the cashiering process ranging from 5 Cent to 11 Cent per transaction. The estimate for Belgium did not include cashiering costs.

4.2 COST OF CARDS IN RETAIL BUSINESS

Estimates for 5 countries are available regarding cost of cards in retail business:

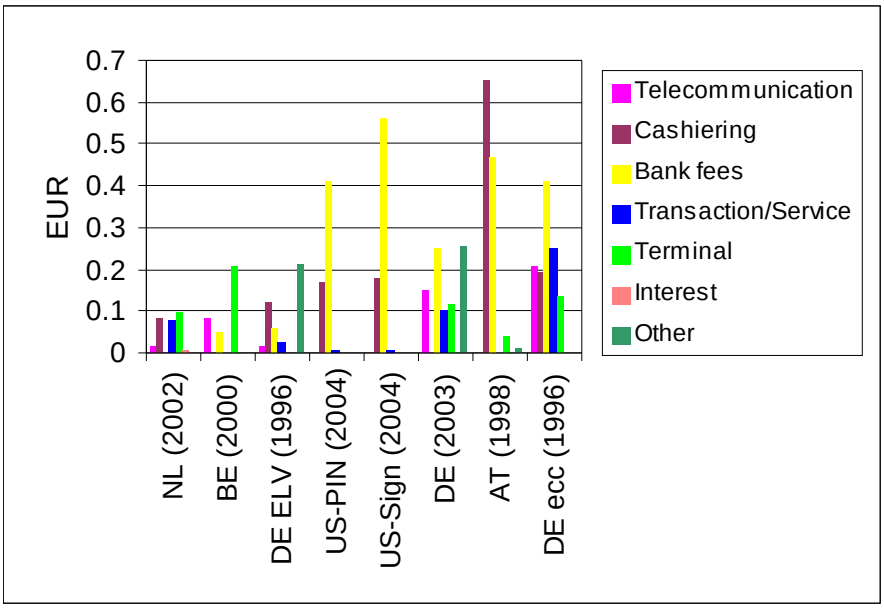
- Belgium
- Germany
- the Netherlands
- Austria
- the United States

Figure 3 Cost of debit card payments for retailers in 5 countries



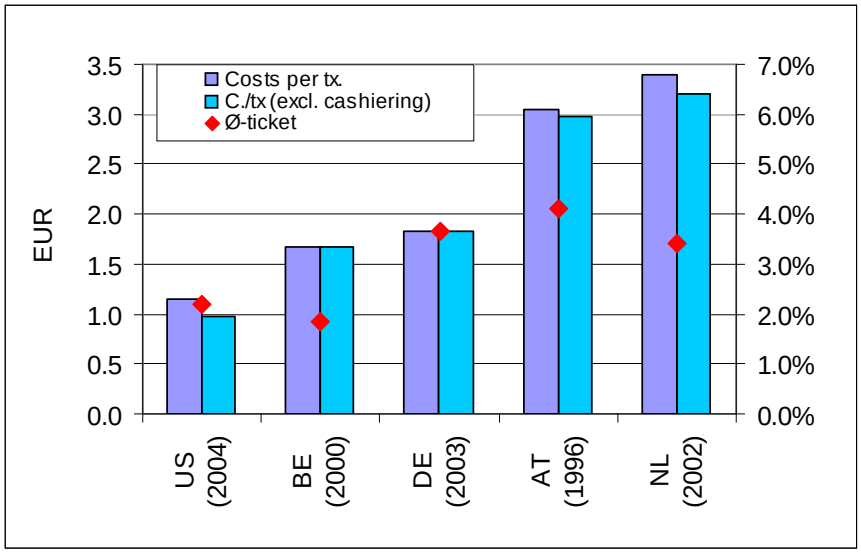
Several estimates concerning debit card costs have been conducted in Germany and in the United States with quite different results. The costs per transaction range from 27 Cent to EUR 1.20. When the costs for the cashiering process are deducted, costs vary from 19 Cent to EUR 1.00.

Figure 4 Structure of debit card costs incurred by retailers in 5 countries



Once again, the individual cost categories deviate widely depending on different frameworks applied. For example, for some countries, ATM and service costs are included in bank charges, in others not. In the United States, fixed costs – e.g. POS-terminal – are not included, in other countries they are. These differences are making a comparison of the results rather difficult.

Figure 5 Cost of credit card payments for retailers in 5 countries



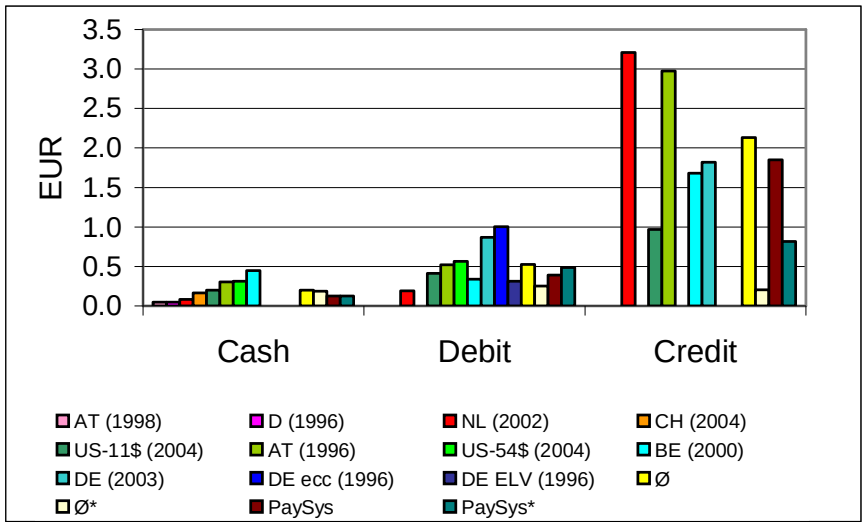
As regards credit cards, the differences and deviations are less manifest. This has to be attributed mainly to the fact that fees (merchant service charges) account for the main bulk of costs incurred by the use of credit cards. On the whole, costs range from EUR 1 € to more than EUR 3 per transaction resp. 1% to 3% of the turnover.

4.3 COMPARISON: COSTS OF CASH AND COSTS OF CARD FOR RETAIL BUSINESS

When comparing the costs for the three payments types, cash comes off best. The unweighted average of the costs for a cash transaction is 20 Cent. The respective value for a debit card transaction amounts to over 50 Cent; and a credit card payment costs about EUR 2 per transaction (3% of turnover). Since the time required for the actual payment process is shorter in case of cash payments - compared to card payments - the cost advantage is even improved when cashiering costs are included into the calculation.

Depending on the type of business, however, it does not always make sense to include cashiering costs.

Figure 6 International cost comparison for retailers: cash versus card payments



Costs per transaction (cashiering costs excluded)
*: fees not included

PaySys estimates are below average with values of 12.5 Cent per transaction for cash payments, but it is no extreme value. As regards costs for card payments, PaySys estimates are comparable to findings of other estimates.

All in all, the available studies indicate comparably low costs for cash use. This does however not imply that cash payments are more efficient than card payments from an economic point of view. On the one hand, cash payments benefit much more from economies of scale than card payments due to the enormous number of transactions. On the other hand, part of the costs to be borne by retailers are fees. They are not classified as costs from an economic point of view, since they are revenues for other sectors – in particular banks and service companies. If the fees are not included in the calculation, retailers face rather similar costs per transaction for all types of payments.

4.4 COST OF CASH FOR BANKS

Many studies have been conducted with regard to costs incurred by banks. These include the analyses mentioned above, dealing with the resource costs for Belgium and the Netherlands that have already been included in the survey on retail business costs. Furthermore, two studies have been conducted in Sweden and Norway and one by the EPC that focus exclusively on the costs for banks.[13]

Table 4 Cost of cash incurred by banks in 5 countries

	Costs in mn. EUR	Costs per capita	Costs per cash withdrawal	of which: ATM-costs in mn. EUR	ATM-Costs per withdrawal
Sweden*	296	33	0.79	234	0.73
Norway	214	48	1.60	105	0.96
Norway**	251	56	0.98	105	0.96
The Netherlands	895	56	1.78	--	--
The Netherlands**	914	57	1.58	--	--
Belgium	449	44	1.97	--	--
EU15	32,000	84	1.99	5,933	0.55
Germany	3,982	49	1.27	1,188	0.50

*: excl. costs for acceptance of cash.
**: incl. cash-back transactions at POS

These studies differ in the frameworks applied to cost structure, the degree of detail and the period considered. This is why the results can be compared to only a limited extent. Finding the correct standard for comparing costs of banks poses a particular problem. Banks dispense cash via ATMs and over the counter, they also accept cash deposits. Data availability is the reason why the following comparison of the overall costs for cash handling incurred by banks is based on the number of withdrawals (number of ATM-tx. and counter tx.). The comparison is supplemented – as far as possible – by a comparison of ATM-costs per ATM-tx.

A look at the above table shows that costs of cash vary between 1.58€/tx. and 1.99€/tx. (excl. cash-back transactions). Only the Swedish estimate ranges below which does however not include costs incurred by accepting cash. If only ATM-transaction costs are

[13] De Grauwe, Buyst and Rinaldi (2000b), European Payments Council (EPC) (2003), Gresvik and Øwre (2003), Guibourg and Segendorf (2004), National Forum on the Payments System (2004).

considered, the values range from EUR 0.55 to EUR 0.96 per cash withdrawal at the ATM. The values provided for Germany remain slightly below those of other countries.

Most notably the EPC estimate conducted for the European Union suggests that ATM transactions account for only a small portion of costs. The bulk is caused by manual handling of counter withdrawals and deposits as well as night deposit and safety bag transactions.

Based on overall costs of EUR 1 - EUR 2 per transaction, cash handling costs of banks appear extremely high. Yet it has to be taken into consideration that cash which is paid out via ATM or at the counter is no „end product“, but an „intermediate product“. After all, customers want to make payments with the money drawn from their accounts. This implies that one withdrawal is generally used for more than only one cash payment transaction. In fact, customers withdraw a sum of money that will suffice for several payment transactions. From a macroeconomic point of view, the costs for one cash withdrawal have to be attributed to several payment transactions.

5 ON THE METHODOLOGY OF COST MEASUREMENT

Measuring the costs incurred by payment transactions brings up a row of methodological and practical problems. The practical problems are mainly due to the fact that costs incurred by payments and transactions are not measured at all in the majority of cases. The gap was closed by means of interviews conducted with representatives of financial institutions, retail business and service companies.

Methodological problems are first of all caused by the question on how to measure costs. Three different units are the ones most commonly applied:

- absolute costs (in EUR)
- costs per transaction (EUR/transaction)

- costs in per cent of the transaction value (%) [14]

Secondly, we face the problem of defining the proper cost concept.

- average costs based on actual volumes
- average costs after shift in payment behaviour
- average costs after the complete substitution of one payment instrument

5.1 Cost Concepts

Absolute numbers are everybody's darling in public discussion – just remember the European Payment Council's (EPC) EUR 50 billion estimate as per annum cost of cash that was a favourite quote at a time – yet they offer no conclusive information. A payment instrument that is widely and intensely used is liable to cause higher costs. This is why it makes much more sense to correlate costs with a parameter that reflects payment activities. Suitable parameters are for example number of transactions and value of transactions.

"Costs per transaction" is the method of choice if the transaction itself is the main cost driver. If on the other hand costs are mainly determined by the value (e.g. because a higher value increases the risk), the more appropriate method is a cost-based comparison calculated in percentage of the transaction value.

Small-value payments generally involve only small risks, the costs are best illustrated by „EUR per transaction". The values will also be shown in % of transaction value for comparison purposes.

Cost comparisons of different payment systems are always based – whether implicitly or explicitly – on simplifying assumptions. Strictly speaking, a comparison based on „costs per transaction" only makes sense if the transactions to be compared are absolutely identical. A comparison based on costs in % of the transaction volume implies that the only

[14] Cash payments are sometimes measured in „costs per bank note". This method does however not allow comparisons with card payments.

difference is the value per transaction. From the point of view the payment system user, several other differences become apparent:

- international or only national use
- users get receipts automatically (electronic or paper) or not (Depending on the type of transaction, this can either be considered an advantage or disadvantage.)
- Payees can keep funds either for an (almost) unlimited or for a limited period
- completely anonymous use or identification of user
- strict separation into two groups – payers and payees (merchants) – or symmetrical roles (everybody is authorised to make and receive payments)

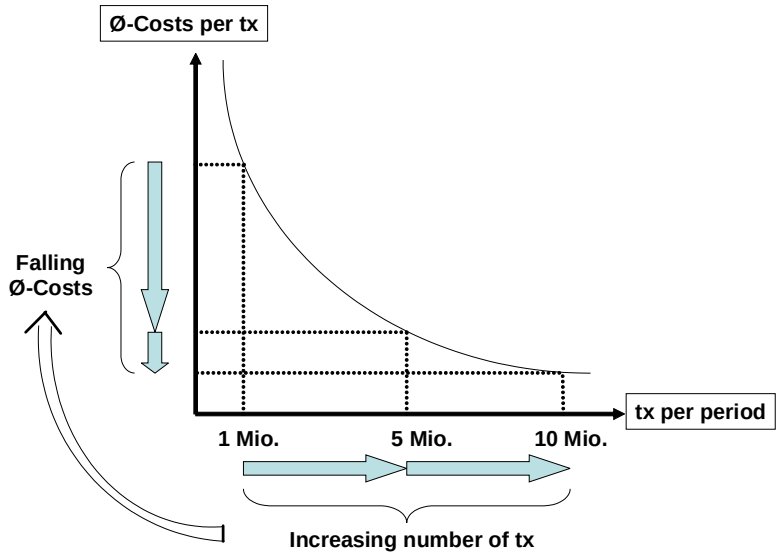
The main factor to be observed in comparing cash and card payments is the absolute anonymity of payment, a fact considered a major advantage of cash by many payers and payees.

5.2 THE MEANING OF DECLINING AVERAGE COSTS

The first objective of the present study is a sound estimate of the average costs incurred by card and cash payments. This requires not only an estimate of the absolute costs but also estimating the number and value of transactions. The latter is quite a problem, particularly with regard to cash payments.

Average costs provide a mere snapshot and may easily reflect a distorted picture. A system, only recently launched and not frequently used at the time of the survey, often shows high costs since the fixed costs have to be allocated to only few transactions. As soon as the system will be used more frequently, average costs will decline due to declining fixed costs and possible learning effects reducing variable costs. The respective cost schedule is shown in Figure 7.

Figure 7 Decline in average costs



It is generally assumed that the costs of payments are declining – i.e. follow the graph shown in figure 1. Assuming that this is the case, high costs may indicate a rather inefficient payment system. But they may also indicate that the system is not working at full capacity.

An interesting aspect for investigation is to analyse the change in costs if the share of card payments increases and the share of cash payment decreases. Theoretically, partial as well as complete substitution of cash could be considered. But today's payment cards offer only limited value as substitute for cash. Estimating the costs for a card-based payment system which is suited as universal replacement for cash belongs rather into the realm of speculation and thus is rejected.

Given the severity of data problems and the problematic choices that have to be made when allocating fixed costs, the goal of this study is to derive a measure of **average costs**. At the end of the study, there is a more qualitative analysis of the possible consequences of a substitution of cash for cards.

5.3 COST ALLOCATION

Establishing costs incurred by payment transactions is additionally complicated due to unclear allocation of expenses. This applies in particular for payment cards and giro accounts.

A giro account forms an integral part of any debit system and also essential for credit card systems since the credit card account is settled by debiting the giro account. The cycle of cash does not necessarily require giro accounts, but cash is normally withdrawn from and deposited into an account. A giro account is therefore de facto embedded into card and cash payment chains.

Any changes in volumes of cash and card payments, however, will hardly affect the number of giro accounts held and the costs incurred by them. The basic framework of the present survey will therefore consider giro accounts as existing infrastructure largely independent from cash and card payments.

Payment cards form an integral part of all card-based payment systems. Simultaneously the cards provide access to ATMs and other self-service terminals. From a historical point of view, for debit cards, the function „cash withdrawal at ATM“ was developed earlier than the payment function. Keeping this in mind, debit cards could be viewed as ATM-cards, with added function for payments at POS.

Since payment cards are primarily issued for supporting payment and cash withdrawal functions, the costs for the cards will also be included, raising again the problem of cost allocation. Basically, costs can be allocated according to following criteria:

- number of transactions
- value of transactions
- number of supported functions
- weighted according to functions

The number of transactions is the criterion which best reflects the actual use of a card and hence will be used as weighting criterion for the purpose of the present study.

5.4 DATA

The results obtained are based on a primary data collection in the retail and banking industry. PaySys Consultancy conducted extensive interviews with two banks and three retail companies who answered a detailed questionnaire covering all factors relevant to the costs of payments. The results were checked, edited, completed and then submitted again for review.

As second step, the interview results were compared to data published by banks, bank associations, retail companies and other sources and completed if necessary. This intermediate step is indispensable

- since the sample is very small and it has to be ensured that the interviews have yielded representative results
- since some data on the costs of payment transactions are either not available or lack the required accuracy.

At this point, PaySys Consultancy brings own knowledge and market experience to validate the results.

The third step finally consisted in an estimate of resource costs. At this point, a flexible approach was applied. If macroeconomic data were available (e.g. for confiscated falsified money), they were employed directly (top-down approach). Other data had to be extrapolated to obtain individual economic data (bottom-up approach). Depending on the types of cost, different parameters were used for data extrapolation. If different parameters were available, several extrapolations were made and then averaged over. Table 5 provides a survey of the type of extrapolation and the additional information used for estimating the costs of banks and retailers.

The figures given for the Bundesbank depend on rough estimates based on business report data. As regards households, only the costs for payment transactions (card and cash payments) and the costs of acquiring and holding cash (loss of interest) were estimated. The authors have refrained from estimating fees since this approach involves great uncertainty in particular with regard to debit cards (debit cards as a rule are part of the ac-

count package). The omission, however, only affects the estimate of sectoral costs – but not that of resource costs.

Table 5 Sources of information used to derive the estimates for retailers and banks

	Extrapolation of survey results	Additional sources of information
Banks	based on: - number of ATMs - Number of branches - Number of accounts - ATM transactions - ATM-volume - Withdrawal/deposit volume	CIT statistics Cost study of DSGV National Cash Plan (ZKA) Bundesbank statistics Other published data
Retailers	based on: - Sales - Branches - Transactions Large differences between large and small retailers have to be taken into account.	CIT statistics Data of polling agents (Netzbetreiber) Data on bank fees Studies of the EHI Bundesbank statistics Other published data

6 QUANTITY STRUCTURE

6.1 CARD PAYMENTS

Data regarding the quantity structure applied are mainly based on a study called „Payment cards in Germany. Statistics 1995-2004“. PaySys Consultancy has systematically been collecting data on the German market for payment cards. These include any published sources and findings of surveys. Missing data are estimated – as far as possible – based on well-grounded assumptions. The results are published in the PaySys study mentioned above. PaySys data are often quoted and drawn on by the Bundesbank for their statistics on the debit card market (estimate on ELV transactions) and on the market for customer cards.

Almost saturated – is the diagnosis for the debit card market with a volume of 89 million cards. Debit cards could be used at approx. 840,000 terminals in 2004, with about 349,100 of them servicing ec cash, a product offered by German banks.

Table 6 Cards and POS terminals

	Debit	Credit
Cards	**89,642,562**	**21,276,017**
Terminals*	**900,000**	**483,972**
of which: ec cash	416,000	0

*: debit card: POS terminals; credit card: card-accepting merchants (VU)

With a total of 21 million cards in use, credit cards are not yet spread nationwide, in contrast to debit cards. Moreover, credit card holders may hold more than one card, so the part of the population holding credit cards is less than 25 %. In addition, the network of credit card-accepting merchants is not as tight as that for debit cards. It has to be kept in mind though, that the figures in the table cannot be compared readily since terminals were counted for debit cards and card-accepting merchants for credit cards. Hence, the difference will be slightly exaggerated.

Table 7 Transactions and turnover 2004 (issuing volume)[15]

	POS-tx (mn.)	POS-turnover (EUR bn.)	turnover/tx (EUR)
Debit cards	**1,839.7**	**113,498.8**	**61.7**
electronic cash	760.6	47,103.0	61.9
POZ	90.2	12,776.0	141.6
ELV	988.9	53,619.8	54.2
Credit cards	**390.3**	**34,457.2**	**88.3**
MasterCard	174.7	14,640.9	83.8
VISA	163.9	15,247.9	93.1
AMEX	48.1	4,242.5	88.3
Diners	3.7	325.8	88.3
total	**2,230.0**	**147,955.9**	**66.3**

A higher number of terminals and cards is also reflected in the transaction volumes. Debit cards show a significantly greater number of transactions and higher turnovers. A total of 2.2 billion card transactions with a volume of EUR 148 billion were performed at the POS in 2004, corresponding to roughly 12% of private consumption.

[15] The acquiring volume for credit cards ranges about EUR 31 billion. So far, the maestro turnover of debit cards has remained so small that differentiating between issuing and acquiring volume can be neglected.

Table 8 Activities per capita and per card

	POS-tx	POS-turnover (EUR)
debit per person	22.4	1,384.1
credit per person	4.8	420.2
debit per card	20.5	1,266.1
credit per card	18.3	1,619.5
total per person	27.2	1,804.3
total per card	20.1	1,333.9

Annual turnover per person amounted to EUR 1,800 in 2004 with debit cards accounting for EUR 1,400 and credit cards for EUR 400. On average, every person performed 27 card transactions (ATM excl.): about 22 debit card transactions and about 5 credit card transactions.

6.2 CASH PAYMENTS

6.2.1 Introduction

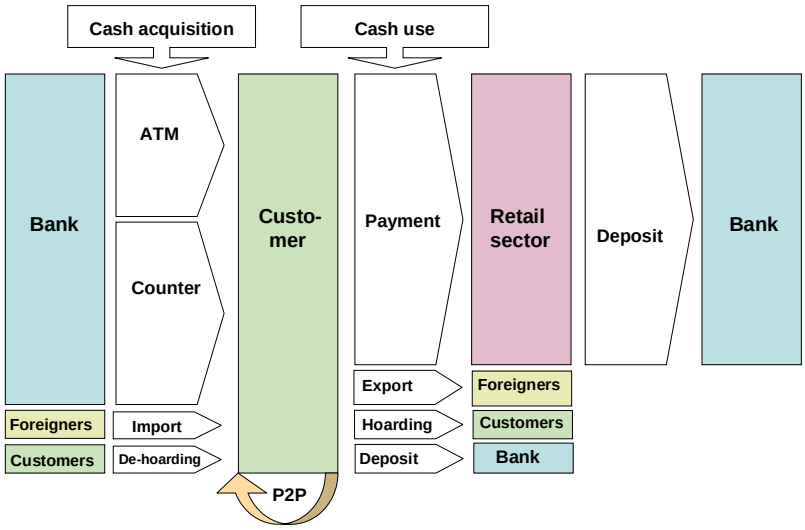
Unfortunately information on the scope of cash payments is scarce and rather unreliable when compared to that on card payments, a fact owing to the nature of cash. Cash payments are not necessarily transacted via service companies registering and storing each and every transaction. This explains why no sources are available providing the desired data. Facing the high level of uncertainty, the present study estimates the volume of cash payments from two sides:

- cash acquisition
- cash spending

Cash used for payment purposes has previously been acquired from an ATM or at the bank counter; the two most important acquiring channels in terms of quantity. Cash can also be received from other consumers (pocket money, pay-back of a sum lent, private sales, etc.). Cash may come from hoardings or flow in from abroad. The user has the possibility to spend the money in retail outlets (in the broader sense), which should be con-

sidered the most important channel of use. Additionally, cash can also be used for paying other individuals. It can be hoarded or accrued abroad. The connection between acquiring and spending is shown in figure 8.

Figure 8 Acquiring and spending of cash[16]



The following equation holds for the circulation of cash:

ATM withdrawals	=	Spending in retail business
+ counter withdrawals		+ cash exports
+ cash imports		+ hoarding
+ de-hoarding		+ deposits into banks
+ p2p payments (person-to-person)		+ p2p payments (person-to-person)

Re-arranged:

ATM withdrawals + counter withdrawals =
spending in retail business + net cash exports + net hoarding

Assuming a rather small sum of net cash exports, net hoarding and deposits into banks, estimates for withdrawals at ATM and counter and the estimate of cash spending should arrive at about the same result.

[16] The effect of salaries, wages and governmental benefits being paid out in cash was very important in the past. The quantitative share of cash has decreased in Germany over the years, whereas it is worth noticing that this does not (yet) apply for other countries. According to APACS, UK£ 16 billion in salaries and wages and UK £56 billion of government benefits were paid in cash in the UK.

6.2.2 Estimating cash payments (at POS and person-to-person)

Deducing figures on payments by cash users is mainly based on the results of interviews and rough estimates. For Germany, the German EHI Retail Institute conducts annual surveys on the instruments used for payments in retail businesses in the narrow sense. The survey yields information on the share the different payment instruments contribute to the turnover. The participating companies' turnover accounts for about 43% of the total turnover in retail (in the broad sense). The results justly fairly representative for the sub-sectors covered. Unfortunately, the results only detail the share of turnover and not the share of transactions.

Table 9 Cash payments in retail (in the narrow sense*) (2004)

turnover in bn. EUR	350	350	350	350
of which cash payments	64.90%	64.90%	64.90%	64.90%
cash turnover (bn. EUR)	227	227	227	227
Ø cash receipt	10	15	20	25
cash tx (bn.)	23	15	11	9
population (mn.)	82	82	82	82
tx per capita	277	185	139	111
turnover per capita (EUR)	2,770	2,770	2,770	2,770

Source: EHI and own calculations

*: Excluding: gas stations, automobile traders, pharmacies, restaurants, hotels, traffic and transport, tourism, vending industry, etc.

For 2004, the EHI estimates the share of cash payments to 64.9% of retail turnover. Depending on the average sales slip (Ø-sales slip) assumed, the resulting transaction volume ranges between 9 billion transactions (Ø-sales slip of EUR 25) and 23 billion transactions (Ø-sales slip of EUR 10) (see Table 9).

The EHI identifies Ø-sales slips for a couple of trades ranging from EUR 13 to EUR 75 for the respective trades. This indicates a rather high Ø-sales slip. Surveys conducted in the Netherlands resulted in average sales slips of EUR 10. It is impossible to determine the amount of the Ø-sales slip without better statistical data available. The authors of the present study therefore refrain from determining one single value, but they show several values (based on Ø-sales slips between EUR 10 and EUR 25).

The EHI-estimate draws on data of retail businesses in the narrow sense. These do not include gas stations, automobile traders, pharmacies, restaurants, hotels, traffic and transport, tourism, vending industry and many more. If all the trades where customers can pay with cash were included, the turnover of „retail in the broad sense" would be more than twice the turnover of retail in the narrow sense. Almost no data are available on the payment habits of customers of retail in the broad sense. The only plausible assumption remaining is using the data collected for retail in the narrow sense.

Table 10 Cash payments in retail business (in the broad sense*) (2004)

turnover in bn EUR	812	812	812	812	812
of which	64.90%	64.90%	64.90%	64.90%	64.90%
cash turnover (bn. EUR)	527	527	527	527	527
Ø cash receipt	10	15	20	25	30
cash tx (bn.)	53	35	26	21	18
population (mn.)	82	82	82	82	82
tx per capita	643	428	321	257	214
turnover per capita (EUR)	6,427	6,427	6,427	6,427	6,427

Source: German Federal Statistical Office and own calculations

*: Including: gas stations, automobile traders, pharmacies, restaurants, hotels, traffic and transport, tourism, vending industry, etc

If the shares estimated by the EHI are applied to the turnover of retail in the broader sense, the annual turnover in cash amounts to EUR 530 billion (see table 10), corresponding to EUR 6,427 per capita per annum. Depending on the amount on the Ø-sales slip, the transaction volume involved can be estimated to 20 to 50 billion transactions – respectively 257 to 643 transactions per capita per annum.

The present estimate does not include the volume of payments between individuals (p2p payments). Data on the volume are not available in Germany. Estimates can only be based on benchmarks established for other countries. In the Netherlands, the Central Bank has had two surveys conducted in order to determine the volume of cash payments. Surveys showed that the share of p2p payments in the total of cash payments ranged between 11% to 13% resp. 56 and 64 p2p cash transactions per capita per annum. Using these figures for Germany, this results in a total amount of cash payments be-

tween 19 billion and 57 billion, corresponding to a number of 228 to 700 transactions per capita per annum.[17]

Table 11 shows the results for a calculation based on the higher Netherlands value of 64 cash transactions per capita in p2p.

Table 11 Macroeconomic volume of cash transactions depending on the Ø-sales slip

Ø receipt	10	15	20	25	30
cash tx (bn.)	58	41	32	27	24
population (mn.)	82	83	84	85	86
tx per capita	707	492	385	321	278
cash value (bn. EUR)	579	613	647	682	718
of which P2P (bn.EUR)	52	80	108	136	165

Supposed that average sales slips are the same in retail business and p2p transactions, a macroeconomic volume of cash payments of EUR 579 to 682 billion is obtained. But any estimates of p2p payments are prone to high uncertainty. Assuming a plausible value of EUR 20 for the average sales slip results in estimated expenses with 32 billion tx and a volume of EUR 647 billion. As the following paragraph will show, this value has to be adjusted upwards.

6.2.3 Estimating the volume of cash withdrawals

A second way for estimating cash payments is looking at how cash is acquired, since every EUR spent has to come from one of four possible sources:

- ATM
- bank counter
- cash hoardings
- abroad

The value of ATM transactions is rather well documented; the value of counter transactions can be estimated by appropriate parameters. Net hoarding and net exports of

[17] It is not possible to give a definite prima facie statement on what assumption is more probable: whether people in Germany have as many per capita p2p transactions as people in the Netherlands or whether the share of p2p transactions in Germany is the same as in the Netherlands.

cash, however, are completely unknown. Yet it can be assumed, that these factors are rather small.

Amount and number of cash withdrawals at ATMs are regularly published by the Bundesbank. According to Bundesbank statistics, 2.4 billion cash withdrawals with a value of EUR 340 billion were performed in 2004. An annual increase of 20% in value and number of transactions in both 2004 and 2003 catches the eye and seems implausible. The increase may, however, have been caused by a shift from counter to ATM. In recent years, the banking industry has tried to push customers to self-service products which may have brought about such a significant effect of the customers' behaviour.[18] We cannot rule out however, errors in measurement affecting the available data, since the banking industry has admitted a lack in appropriate technology for exactly determining ATM transactions and the respective values.

- The "1/3 - 2/3 rule"

No central statistics are available with regard to counter withdrawals. The ZKA estimates that 1/3 of all cash withdrawals take place at the ATM and 2/3 of the value are paid out at the counter (measured with regard to the value of transactions[19]). Assuming the „2/3 - 1/3 rule" as a basis, the transaction volume amounts to EUR 1 million, a sum much higher than the volume obtained on the basis of retail turnovers.

- Substitution scenario

If the above assumption on the substitution of counter withdrawals by ATM withdrawals is true, an increase of ATM withdrawals would have to be accompanied by a decrease in counter withdrawals. In this case, the 2/3 - 1/3 rule could at best be applied to 2002, a year with a payment volume of EUR 795 billion. Assuming merely minor changes in overall withdrawals, the total volume would be a constant volume of roughly EUR 800 billion.

[18] Sparkasse Hannover announced that 95% of all cash transactions are performed at the ATM. See Dieter Casper: Die Kartenstrategie einer Großsparkasse, Bankkartenforum, 22.9.2005.

Table 12 Cash withdrawals at counter: estimate of volume

assumption	1/3-2/3 rule still valid			increasing substitution of OTC tx by ATM tx		
	2002	2003	2004	2002	2003	2004
ATM withdrawal (bn. EUR)	265	304	340	265	304	340
OTC (bn. EUR)	530	607	681	530	492	455
total (bn. Eur)	795	911	1 021	795	795	795
population (mn.)	83	83	83	83	83	83
cash withdrawal p. capita (EUR)	9 640	11 036	12 369	9 640	9 635	9 635

From the above estimates a lower limit of the value of cash withdrawal of about EUR 800 billion, and a higher limit of about EUR 1 million can be deducted. The number of withdrawal transactions ranges between 2.5 and 3.6 billion.

Table 13 Cash withdrawals at counter: estimate of transactions

assumption	1/3-2/3 rule still valid			increasing substitution of OTC tx by ATM tx		
	2002	2003	2004	2002	2003	2004
ATM withdrawal (mn. tx)	1 668	2 036	2 399	1 668	2 036	2 399
OTC (mn. tx)	834	1 018	1 199	834	466	104
total (mn. tx)	2 503	3 055	3 598	2 503	2 503	2 503
population (mn.)	83	83	83	83	83	83
cash withdrawal per capita (tx)	30	37	44	30	30	30

- Estimate based on survey data

In order to reduce the possible range, the data given by the participating institutions were extrapolated to the national economy. Every institution stated a significantly lower proportion of counter withdrawals compared to ATM withdrawals than that estimated by ZKA.

Table 14 Cash withdrawals at counter: estimate based on survey

[19] ZKA: The National Cash Plan Germany, DSD 2 / 2004, p. 14-18.

	institute 1	institute 2	Ø
ATM proportion of total EUR	45.21%	40.13%	**42.67%**
ATM proporton of total tx.	82.92%	87.06%	**84.99%**
OTC withdrawals (bn. EUR)	412	508	**460**
OTC withdrawals (mn. tx)	494	357	**425**
OTC deposits (bn. EUR)	412	513	**463**
OTC deposits (mn. Tx)	329	301	**315**

The estimates detailed in table 14 were obtained by calculating the turnover at the bank counter based on the average ATM share of the institutions participating in the survey and the present ATM figures for Germany as a whole.

If the calculation is based on the average values of the participating institutions, the volume of counter withdrawals amounts to EUR 460 billion. This corresponds rather accurately to the volume calculated above under the assumption of „increasing substitution". Yet the number of estimated transactions (425 million) is definitely higher, perhaps resulting from customers withdrawing smaller sums when using the ATM instead of the counter. If this is the case, the number of transactions increases while the volume of withdrawals remains the same.

Table 15 Estimate of deposit and withdrawal volume

	bn. EUR	mn. tx	EUR/tx
ATM	340	2,399	142
OTC withdrawals	460	425	1,081
OTC deposits	463	315	1,467
OTC total	923	741	1,245
night safe	43	8	5,717
total withdrawals	800	2,824	283
total deposits	923	323	2,856
deposits and withdrawals	1,385	3,147	440

Since the data obtained by the interviews are the only hard data with regard to counter withdrawals and results are compatible with other extrapolations, they will serve as basis for estimating the withdrawal volume.

In the end, the final volume of withdrawals amounts to about EUR 800 billion (EUR 340 billion at ATM and EUR 460 billion at the counter). The number of withdrawal transactions

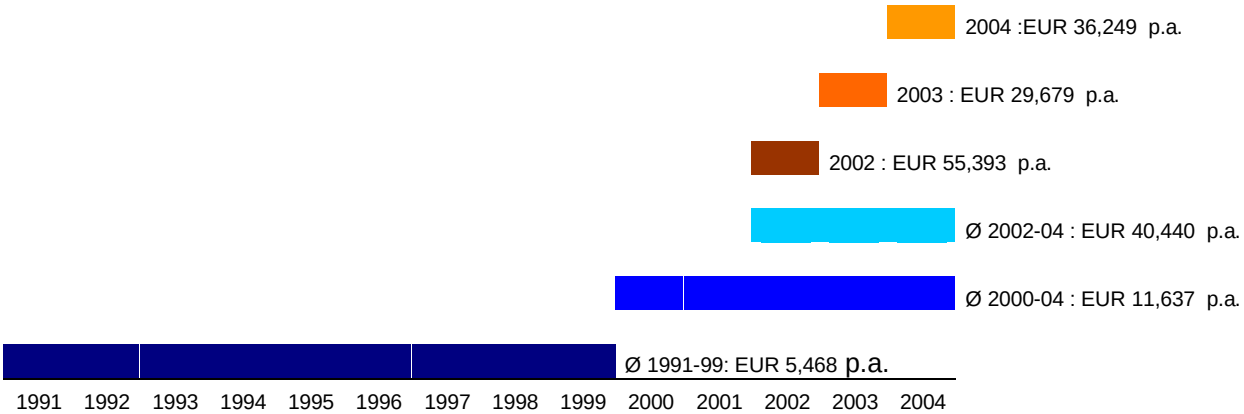
ranges at about 2.8 billion (2.4 billion ATM transactions and more than 400 billion counter transactions).

Estimates on the volume of cash withdrawals at the counter resp. the ATM therefore range high above the estimated cash payment volume of 647 billion EUR.

6.2.4 The importance of hoarding and de-hoarding

Apart from counter and ATM, hoarded cash ("de-hoarding") may constitute another possible source for cash payments. On the other hand, cash can vanish by being added to hoards ("hoarding"). What counts from the point of view of this study is net hoarding. Although there is no information at all available on hoarding and de-hoarding, one possible point to start from are changes in cash circulation.

Figure 9 Ø annual increase in the amount of cash in different periods (in million EUR)



Source: Bundesbank and own calculations; p.a.: per annum
For the period after 2001 the figures under „German contribution" regarding cash circulation must be supplemented by the entry „Intra-Eurosystem-claims/liabilities from the issuance of Euro banknotes". The sum thus determined corresponds to the net sum of cash issued by the Bundesbank.

From 1991 to 1999 the amount of cash in circulation increased by approximately EUR 5.5 billion. After two years of negative growth before the introduction of Euro currency, the volume of cash has been rapidly growing since 2002. This is mainly accounted for by a normalisation of extremely low cash inventories at the beginning of 2002, consequently

followed by a decrease in the growth of cash from EUR 55 billion to hardly EUR 30 billion. In 2004, however, the value of cash holdings increased by EUR 36 billion. The development in 2004 can hardly be explained by a normalisation of cash holdings. The reasons for the augmentation are not known, but maybe part of this increase is not caused by national circulation. Any money spent by German tourists in other European countries flows to the respective local Central Banks. Euros spent abroad are not used for payments in Germany and do not remain in the country. Cash payments sent to non-Euro countries by financial institutions exert a similar effect. Demand for EUR is high in these countries (as formerly for DM) and German banks seem to be particularly involved in cash transfers to these countries, a fact that additionally increases the amount of cash issued by the Bundesbank. A third reason may be found in a growing sense of insecurity with regard to the development of the German fiscal and social systems (cue „Hartz IV") further pushing the demand for cash. To the same extent as citizens have to worry about social benefits that will only be paid after any private funds have been consumed, they will try to hide their funds, e.g. by increasingly using cash for building financial resources.

The overall effect is an increased demand for cash that is not used for payment transactions inside the country to the same extent. The reasons detailed above may contribute to explaining the gap between estimated volume of cash payment and volume of cash withdrawals. On the other hand, the dimensions should be kept in mind - a gap of 150 billion EUR vis-à-vis an increase of cash circulation of EUR 36 billion in 2004.[20]

Therefore, even the inclusion of hoarding and circulation abroad cannot close the gap between the two estimates. With an estimated net hoarding and cash drain to other countries of EUR 50 billion, an estimate on cash withdrawals of EUR 800 billion compared to an averaged estimate of cash payments of about EUR 650 billion still implies a gap of roughly EUR 100 billion. This gap is caused by spending not included in the original estimate. If the same average value is assumed as for retail businesses, the gap definitely

[20] Part of these EUR 36 billion is probably caused by banks transferring cash to other countries. These sums are not included in the estimate of cash withdrawals (ATM, counter) and therefore have to be deducted from the 36 billion mentioned above.

requires correction upwards, i.e. EUR 100 billion with an average payment of 20 EUR result in an additional 5 billion of transactions (approx. 63 Tx per capita).

Based on these assumptions, estimates are

- cash payment volume: 750 billion EUR and
- number of cash transactions: 37.5 billion

Table 16 Corrected estimate of cash transactions

	total	per capita
value	750 bn. €	9,146 €
number (Ø receipt of 20 €)	37,5 bn.	457
number (Ø receipt of 10 €)	75 bn.	916

The estimate on transactions is liable to higher uncertainty than the estimate on the value of expenditures. If the value of the average sales slip remains significantly under EUR 20, the number of cash payments would be much higher. An average sales slip of EUR 10 would increase the estimated number of transactions to 75 billion.

6.2.5 Comparison with other estimates

Estimating the values and the number of cash transactions is always based on a number of critical assumptions which render the results highly unreliable. This is why it is important to compare the findings with those of other estimates and to verify and control them as far as possible.

Table 17 Estimate of the Bundesbank on cash transactions

	D (1978)	D (1983)	D (1985)	D (1986)
cash tx (bn.)	35	35	38	38
cash tx per capita	570	570	650	650

The estimates refer to West Germany/the former Federal Republic of Germany.

Unfortunately, there are almost no estimates for Germany suitable for comparison. The Bundesbank has not paid as much attention to collecting data on payment transactions

as for example the Central Bank of the Netherlands. There are only a couple of rather old estimates on the number of cash payment transactions per capita. The Bundesbank estimated the number of transactions to 570 to 650 transactions per capita for the years 1978 to 1986. These estimates are only mentioned in footnotes without any details on how they came about. The estimates do however range in the limits given above – that is in the upper margin.

Payment habits differ from country to country which is why other countries' habits only provide limited use as a benchmark for Germany. It still holds true, however, for most countries that cash is the most important payment instrument in retail and p2p transactions, if the number of transactions is the basis for measuring. Although there are great differences in the use of checks and payment cards, the number of transactions conducted with these alternative payment instruments is much too small to effect big differences in the number of cash transactions. For this reason, findings for other countries, in particular in Europe, will shed light on the volume of cash payments in Germany, at least with regard to the volume.

Four individual estimates have been published during the last years, as well a comparative survey for several countries. The individual surveys refer to Belgium, the Netherlands, the UK and the European Union. The results are detailed in the table below.

Table 18 Four European surveys on cash transactions

	BE (1998)	EU (2001)	NI (2002)	UK (2002)
cash tx (bn.)	3.0	360.0	8.0	27.2
population	10.2	378.0	16.1	59.2
cash tx. per capita	294	952	495	460

There is no detailed information available on how the surveys for the European Union and for Belgium were conducted, preventing judgment on their quality. It is rather obvious that the survey for the European Union arrives at a somewhat high value (952 transactions per capita), whereas the values for Belgium are more at the bottom limit of those found for Germany.

The surveys for the Netherlands and for the UK are based on interviews. They were both aimed at registering transactions as complete as possible – also including p2p transactions. Though interviews always pose a problem in terms of representativeness (the Central Bank of the Netherlands assumes that the results are distorted to the disadvantage of cash), such results provide a much more solid basis than methods which after all are merely employing "plausible" parameter values. The results gain further credibility in that both reach similar results with a value for the number of per capita transactions just below 500.

Finally, a survey by McKinsey provides data on the number of cash transaction in 8 countries. As, unfortunately, there are no clues on how the figures were obtained, assessing the quality of the survey is not possible. Just for the record: the figures for Germany are in line with those established by other surveys. The average values for the eight West European countries correspond to those established by the surveys for the Netherlands and the UK.

Table 19 McKinsey estimate of cash transactions

	Tx per household	Proportion of cash	Cash tx per household	Cash Tx per capita	Cash Tx (1000)
Pol	1.760	98%	1.725		
Es	1.970	93%	1.832	632	24.332.120
It	1.500	93%	1.395	537	30.643.965
D	**1.470**	**86%**	**1.264**	**575**	**47.674.246**
US	2.900	82%	2.378	911	257.844.444
Sw	990	82%	812	427	3.714.797
B	1.100	78%	858	358	3.670.524
NL	1.400	75%	1.050	457	7.233.450
UK	1.240	72%	893	388	22.823.539
F	1.100	71%	781	325	19.152.463
EUR8*	1.384	83%	1.147	481	159.245.104

*: Es, It, D, Sw, B, Nl, Uk, F

Sources: McKinsey (2005), Eurostat, U.S. Census Bureau and own calculations

On the whole, the estimated value of 481 cash transactions per capita established by the present study seems in line with other surveys. Only the EPC with an average 900 transactions for the EU population estimated a much higher value.

7 COST OF CASH

7.1 BUNDESBANK

The Bundesbank publishes a rough cost survey in its annual report, but no explicit business area accounting. Any figures on costs to be allocated to cash management activities detailed in table 20 are only rough estimates.

Table 20 Overall expenditures of the Bundesbank

	2005	2004	2003
Staff	970	935	1,000
Other admin costs	223	224	263
Depreciation	154	178	172
Note printing	93	53	82
Other	21	56	217
Total	1,461	1,446	1,734

Banknote printing is the only entry in the Bundesbank business report which can obviously be allocated to cash business. Assuming cash business to constitute a significant cost driving factor, about 60 % of the other costs were allocated to cash business. Based on the above assumption, costs of EUR 890 billion were incurred in 2004.

Table 21 Cost of cash for the Bundesbank

	2005	2004	2003
Cash processing	820.8	835.8	991.2
Note printing	93	53	82
Cash costs	**913.8**	**888.8**	**1073.2**

The above estimate – which admittedly is rather a rough one – is however in line with surveys published by the EPC. They estimated costs of about EUR 5 billion for the European Central Banks. With a supposed share of Bundesbank amounting to 20 %, the estimated value amounts to EUR 1 billion, approximately corresponding to the average of the values estimated in the present survey for 2003 and 2004.

7.2 BANKS

The cost of cash to be borne by the banking industry are estimated to roughly EUR 4 billion based on selective use of interview results and inclusion of other sources of information.

The majority of cost is incurred by counter transactions. ATM transactions produce costs amounting to EUR 1.2 billion and night deposit and safety bag transactions are reflected in the budget with approximately EUR 48 million.

Table 22 Cost of cash for the banking industry

Cash costs (mn. EUR)	Total	Counter	ATM	NT
Cashiers	1,566 €	1,566.4 €	0.0 €	0.0 €
Counter equipment	416 €	415.8 €	0.0 €	0.0 €
Rent	260 €	164.9 €	94.8 €	0.0 €
Insurance	25 €	13.6 €	10.1 €	1.3 €
ATM, depositmachine, recycler	0 €	0.0 €	0.0 €	0.0 €
- Investment/Depreciation	103 €	0.0 €	102.9 €	0.0 €
- Installation / Maintenance	105 €	0.0 €	105.4 €	0.0 €
- Filling/Transport	344 €	0.0 €	343.8 €	0.0 €
- Processing	131 €	0.0 €	131.3 €	0.0 €
- Insurance	14 €	0.0 €	13.5 €	0.0 €
- Account	45 €	0.0 €	45.4 €	0.0 €
Night deposit	36 €	0.0 €	0.0 €	36.0 €
Cash processing	50 €	49.7 €	0.0 €	0.0 €
Cash logistics	31 €	16.7 €	12.3 €	1.6 €
Transport (from/to Bundesbank branch)	99 €	90.9 €	0.0 €	8.6 €
Interest	308 €	168.1 €	124.3 €	0.0 €
Counterfeiting/Theft	2 €	1.5 €	0.0 €	0.0 €
General/Overhead	18 €	9.5 €	7.1 €	0.9 €
System development	200 €	100.0 €	100.0 €	0.0 €
Card, PIN, etc.	218 €	125.3 €	92.6 €	0.0 €
Total	**3,970 €**	**2,723 €**	**1,183 €**	**48 €**

In order to ensure correct interpretation of above figures, costs must be seen in relation to the value of transactions or to their number. Though costs at the counter and at the ATM are quite similar when expressed in percentage of value, significant differences emerge when they are compared on a EUR-per-transaction basis: a transaction at the counter produces average costs amounting to 0.32% of the turnover or EUR 3.65, an ATM transaction incurs costs of 0.34% or EUR 0.49.

Different methods of calculation producing an extremely diverging result with regard to relative costs is a matter to be explained rather simply: Counter transactions generally involve essentially higher sums (EUR 1,081) than ATM transactions (EUR 142).

Table 23 Bank costs: Selected indicators

	Total	Counter	ATM	NT
Payments in bn. EUR (incl. deposits)	1,306	923	340	43
Payment-tx (in mn.)	3,147	741	2,399	8
Costs of in % of volume	0.30%	0.29%	0.34%	0.11%
Costs per tx (in EUR)	1.25 €	3.65 €	0.49 €	6.38 €
Deposits (Mrd. EUR)	506	463	0	43
Deposits (Mio. Tx)	323	315	0	8
Withdrawals (Mrd. EUR)	800	460	340	0
Withdrawals (Mio. Tx)	2,824	425	2,399	0
Share of deposits (volume)	39%	50%	0.00%	100%
Share of deposits (tx)	10%	43%	0.00%	100%
Costs of deposits (volume-based) (mn.EUR)	1,405 €	1,357 €	0 €	48 €
Costs of deposits (tx-based) (mn. EUR)	1,200 €	1,152 €	0 €	48 €
Costs of deposits: average (mn. EUR)	1,303 €	1,254 €	0 €	48 €
Costs of withdrawals (volume-based) (mn.EUR)	2,520 €	1,349 €	1,171 €	0 €
Costs of withdrawals (tx-based) (mn. EUR)	2,724 €	1,553 €	1,171 €	0 €
Costs of withdrawals: average (mn. EUR)	2,622 €	1,451 €	1,171 €	0 €
Costs of deposits in %	0.26%	0.27%	0.00%	0.11%
Costs of deposits per tx	4.03 €	3.65 €	0.00 €	6.38 €
Costs of withdrawals in %	0.33%	0.32%	0.34%	0.00%
Costs of withdrawals per tx	0.93 €	3.65 €	0.49 €	0.00 €

Looking at the different cost categories shows that personnel costs account for the bulk of costs, exceeding EUR 1.9 billion. They are mainly incurred by counter activities (almost EUR 1.6 billion). Yet replenishing and emptying ATMs is a task still frequently performed by bank staff and causes costs of more than EUR 350 billion (incl. further back-office functions). Costs for location, safety equipment, hardware and software amount to approx. EUR 1.2 billion. Expenses for service companies of approx. EUR 345 billion are relatively low for the time being. Costs for lost interest amount to about EUR 308 billion– with interest rates at a historically low level.

Further costs like insurance, technical processing of ATM transactions and risk of counterfeited currency are of less importance.

Table 24 Cost categories

Cash costs (mn. EUR)	Total	Counter	ATM	NT
Service provider	345	141	160	45
Staff	1,949	1,593	354	2
Hardware/software (inc. rent)	1,196	806	390	0
Processing ATM	131	0	131	0
Insurance	38	14	24	1
Interest	308	168	124	0
Risk	2	2	0	0
Total	3,970	2,723	1,183	48

- Expenses for external service companies

These include transport of cash, cash processing, replenishing and emptying of ATMs, emptying night deposits and ATM maintenance.

Estimating expenses for above activities is rendered difficult due to strongly differing data for the interviewed institutions caused by different outsourcing strategies being followed. The extrapolation is based on the assumption that the level of outsourcing in the market is generally lower than the average of the interviewed institutions. The figures have not simply been averaged but are selectively weighted.

- Personnel expenses

Extrapolating personnel expenses also encounters severe data problems. The figures obtained in the survey did not seem an appropriate basis for extrapolation. Hence, the present estimate was based on the survey of the DSGV and yielded a total sum of EUR 1.9 billion for personnel expenses.

Costs for cashiers were calculated according to rule of thumb assuming „0.7 cashiers per branch“. An almost identical value was obtained when extrapolating the figures of one participant based on the number of private giro accounts. The remaining value was attributed to the entries „cash logistics“, „account management“, „overhead“ and „replenishing/emptying ATM“. The lion's share (EUR 290 million) falls upon „replenishing/emptying ATM“.

- Hardware and software

This item includes „hardware“ in the broadest sense (ATMs, safety facilities, buildings, etc.) as well as software for cash dispensers and cash disposition and control. Based on the interviews, the space required for a cash desk was estimated to 10 sq.m, the required space for an ATM (incl. secured access from behind) to 5 sq.m. The rent per sq.m amounted to an assumed EUR 30. Reference values for the calculation are not available.

Depreciation costs for cash dispensers and software were estimated to roughly EUR 300 billion based on the data given by one participant, a sum that corresponds to an independent PaySys survey determining EUR 274 million.

The costs for system development and the respective share of card costs add up to costs of more than EUR 400 million.

- Processing

Estimates for the costs of technical processing of ATM transactions (account management, authorisation, C&S) have been based on the figures of one participant. They amount to 130 million EUR, approximately corresponding to 5.5 Cent per transaction.

- Insurance

Insurance costs account for only a small portion of costs. Based on the figures obtained from the participants and on the DSGV study on cash, the estimated value amounts to 37 EUR million.

- Interest

According to Bundesbank statistics cash inventories in the banking industry amounted to an average EUR 13.4 billion in 2004, corresponding to costs of 308 EUR million (applying an interest rate of 2.3%).

- Risks

Losses caused by counterfeited bills are estimated based on interview data and amount to roughly EUR 1.5 million. The Bundesbank discloses a volume of counterfeited money of EUR 6.2 million for 2004. Since retail business is the sector mainly affected, the estimated value for banks seems plausible.

7.3 RETAIL BUSINESS

The cost of cash incurred by retailers amounts to roughly EUR 5.8 billion, if cashiering costs for the POS payment are included. If not, costs are reduced to roughly EUR 3.3 billion.

Table 25 Cost of cash in the retail sector

		Costs (mn. EUR)	per tx	in %
	Cashier	2,529	0.096	0.48%
	Interest	103	0.004	0.02%
Min	Processing/Transport	2,593	0.098	0.49%
Max	Processing/Transport	3,578	0.136	0.68%
	Hardware	103	0.004	0.0195%
	Counterfeits	5	0.000	0.0009%
	With cashier costs			
	Total (min)	5,333	0.202	1.01%
	Total (max)	6,318	0.240	1.20%
	Average	5,826	0.221	1.11%
	Without cashier costs			
	Total (min)	2,803	0.106	0.53%
	Total (max)	3,789	0.144	0.72%
	Average	3,296	0.125	0.63%

This estimate is however liable to serious uncertainty, in particular with respect to cash processing and cash in transit. Facing the heterogeneous structure of individual retail merchants, no standard procedure is available. While big retail companies have out-sourced the main bulk of cash processing activities, small companies do it all on their own. This is the reason why no generally applicable method for extrapolating is at hand. For the purpose of the present survey, the results of the interviews have been split into two groups depending on company size: big companies (turnover > EUR 25 million) and small businesses. Several extrapolations have been conducted for both groups:

- based on the estimated number of sales transactions

- based on the estimated cash turnover
- based on the number of branch offices or stores
- small businesses with regard to branch offices and big companies with regard to turnover

The above table lists the maximum and the minimum value for the estimates. Since it is impossible to determine the most reliable method of estimation, using the simple average seems most appropriate.

7.3.1 Estimate of the individual cost categories

- Costs of the cashiering process

An important cost factor – at least for parts of the retail sector – is the time needed for the actual payment at the POS. It is however not clear how many retailers include these costs when making business-relevant decisions. In order to gain a glimpse on the potential volume, available estimates of the time duration were extrapolated to a macroeconomic scale; the projection was based on the number of transactions.

Table 26 Costs of the cashiering process

	Costs in mn. EUR	Costs per tx	in % of sales
Cash costs*	2.53	0.10 €	0.48%

*: duration of payment process: 21.2 seconds (acc. to EHI)

Financing costs are incurred because the sales value is not immediately credited to the merchant's account. In general, about 1.5 days elapse until the money is deposited and credited to the account. The cash takings do not bear interest during that period. With cash takings of approximately EUR 527 billion, costs amount to EUR 103 million.

Table 27 Financing costs for cash payment transactions

	Days	Volume	Tx (bn.)*	Ø vol. of finance (bn. EUR)	Costs of finance (mn. EUR)	Costs in %	Costs per tx
Cash	1.5	527	26	2.17	**102.88**	0.02%	0.004 €

„days": days until value date, interest rate: 0.0475 (debit interest rate for non-financial corporations)
*: assumption: Ø-sales slip of 20€ per tx.

- Cash supply and disposal

This heading includes the following cost categories:

- supply and disposal of cash for cash register
- back-office (control, sorting, counting – by retailer or service company)
- cash in transit / transportation

As already discussed above, the estimates differ widely depending on the method used for extrapolating companies' individual results. They range from EUR 2.6 billion to EUR 3.6 billion.

Table 28 Cost of cash supply and disposal

	Total costs in bn. EUR
Maximum	**3.58**
Minimum	**2.59**
Average	2.98

In order to provide a sound basis for the estimate, participating companies are divided into two groups: those with a turnover below EUR 25 million and big companies (turnover > EUR 25 million). The survey provides 3 estimates for each of both.

- costs per transaction
- costs in percentage of turnover
- costs per daily closing balance for each branch office[21]

Each of the estimated values serves as basis for an extrapolation for the retail business as a whole. In addition, a selective extrapolation will be used for individual calculations for small and large companies.

Since detailed information for the two groups (size of turnover) is only available for retail in the narrow sense, the estimated values pertaining retail in the narrow sense will be extrapolated to retail in the broader sense.

Table 29 Estimated parameter values

Retailing in the narrow sense plus restaurants	per POS-tx	in % of sales	per branch per day
Companies up to sales of 25 mn. EUR	0.17 €	0.85%	10.7 €
Large companies	0.07 €	0.31%	10.2 €
Total	0.12 €	0.57%	10.6 €

Table 30 Option 1: Extrapolation based on turnover

	Sales in bn. EUR	Unit costs	Costs in mn. EUR
Companies up to sales of 25 mn. EUR	176	0.85%	1,501
Large companies	187	0.31%	571
Retailing (narrow) + restaurants	363	0.57%	2,072
Extrapolated to retailing (broad)			3,056

Table 31 Option 2: Extrapolation based on transaction

	Sales in bn. EUR	Unit costs	Costs in mn. EUR
Companies up to sales of 25 mn. EUR	7	0.17 €	1,201
Large companies	7	0.07 €	557
Retailing (narrow) + restaurants	15	0.12 €	1,758
Extrapolated to retailing (broad)			2,593

Table 32 Option 3: Extrapolation based on daily-closings of branch offices

	Sales in bn. EUR	Unit costs	Costs in mn. EUR
Companies up to sales of 25 mn. EUR	208	10.65 €	2,215
Large companies	21	10.17 €	210
Retailing (narrow) + restaurants	229	10.61 €	2,426
Extrapolated to retailing (broad)			3,578

Table 33 Option 4: Mixture of fixed sum for small businesses and turnover-dependent costs for large companies

[21] This method required an estimate of the number of branch offices.

	Costs in mn. EUR
Retailing (narrow) + restaurants	1,778
Extrapolated to retailing (broad)	2,700

- Costs for hardware

These are mainly costs for safes etc. Only few companies seem to use equipment for the detection of counterfeited money so far.

Table 34 Costs for secure storage

	Costs of Hardware
Number of branches	1,202,017
Costs per branch (EUR)	85
Total costs of hardware (mn. EUR)	103

- Costs caused by counterfeited money

Estimates on the costs incurred by accepting counterfeited money have been based on the Bundesbank statistics.

Table 35 Costs caused by counterfeited money

	2004
Bundesbank 2004 (mn. EUR)	6.07
Assumption: Counterfeit losses of retailers	5.00
in % of Sales	0.0006%

7.4 HOUSEHOLDS

Costs to be borne by the households arise from costs incurred by the cashiering process, costs for cash acquiring, fees and loss of interest. They amount to about EUR 3.9 billion. If cashiering costs are excluded, a total of almost EUR 1.5 billion remains.

Table 36 Cost of cash for households

	mn. EUR
Interest	753
Withdrawal costs	232
Fees	480
Sub-total	1,465
Payment time	2,386
Total	3,851

7.4.1 Costs of the cashiering process

If the costs of the cashiering process are included in retailers' costs, they must also enter the calculation for households. Assuming opportunity costs of time are about the same, costs incurred can be supposed to be similar.[22]

Table 37 Costs of the cashiering process

	Costs in bn. EUR	Costs per tx	in % of sales
Cash costs*	2.53	0.10 €	0.48%

*: duration of payment transactions: 21.2 seconds (acc. to EHI)

Costs for p2p payment transactions are not included. The general assumption that the time required for making a payment is not always considered as expenses probably applies for households even more than for retail.

7.4.2 Cost of cash acquiring

Households incur costs during payment transactions at the cash desk, when acquiring cash and when holding cash that does not bear interest. Moreover, they have to pay banking fees, incurred in particular when the money is not acquired at the own bank (not member of the same ATM pool as the card issuing bank).

Table 38 Cost of cash acquiring

	mn. EUR
Cash acquiring	232

[22] p2p payments are not included.

An estimate of time costs incurred by acquiring cash ("travel expenses") proves difficult. On the one hand, ATMs or bank counter may be situated just around the corner, resulting in very low travel expenses; on the other hand, households may have to face long ways for getting to the nearest ATM. Even short ways result in rather impressive costs. Even if only 3 minutes per transaction are assumed, costs will amount to almost EUR 3 billion.

Table 39 Sample calculation:

	Value	Comment
Costs of an hour	20 €	
Time required for a withdrawal	0.05	3 Minutes
Costs per withdrawal	1 €	
Withdrawals (mn.)	2,824	Counter + ATM
Total costs (mn. EUR)	2,824	Counter + ATM

Such a calculation may seem plausible at first sight; but the behaviour of households indicates essentially lower costs. They avail of a fairly simple tool for reducing travel expenses. All they have to do is go to the bank less frequently and withdraw more cash, each time. Although this will cause interest costs to rise, the following calculation shows that such an increase is very small.

If households, however, do not choose this method, it can be assumed vice versa that costs are not perceived to be too high.

- A simple cash management model:

These models are generally used for deducing the optimum number of withdrawals or optimum cash holdings. The optimum cash holding is derived from the amount of planned payments (T), transaction costs (b) and an interest rate (r). The same model can also be applied to assess transaction costs based on the number of ATM transaction (k), interest rate and withdrawal volume:

$$b = (0{,}5k^2 r)/T$$

The calculation has to discern between households with accounts in overdraft (paying a debit interest rate: "optimiser 1") and households with a credit balance (receiving a credit interest rate: "optimiser 2"). Moreover, interest rates can be increased by adding a risk surcharge reflecting possible hazards of cash being lost or stolen.[23]

Table 40 Assumed values

	Value	Comment
ATM EUR bn.	340	
Population	82	
Percentage of ATM users	0.67	
ATM user (mn.)	55	
ATM p.c.	6,220	EUR per year
ATM p.c. per month	518	EUR per months
Interest rate 1	0.02	Credit (positive balance) rate
Interest rate 2	0.1	Debit (overdraft) rate
Risk	0.05	Theft, loss
ATM-tx	2.4	
EUR/tx	142	

Table 41 Implicit costs per withdrawal

	EUR per tx	mn. EUR	Comment
Optimiser 1	0.032	77.44	Opportunity costs: Overdraft interest rate
Optimiser 2	0.161	387.22	Opportunity costs: Credit interest rate
Average	0.097	232.33	
Fearful optimiser	0.242	580.83	Opportunity costs: Overdraft rate + 5% risk premium

The calculation demonstrates that actual travel expenses are probably much lower than suggested by the first rough calculation. Even with an assumed debit interest rate of 10% and a risk premium of 5%, household habits indicate transaction costs of merely 30 Cent per ATM transaction. Values further decline if a lower interest rate is applied. On the other hand, it has to be assumed that households will use ATMs less frequently and withdraw higher sums per transaction, if transaction costs amounted to EUR 1.

The final estimate of withdrawal costs is the simple average of the costs of credit and debit interest rate optimisers.

[23] If a risk premium is included, opportunity costs will always be bigger than nil.

It is not clear, whether and at what price risk premia should be applied. If applied to cash, such risk premia should also be included in card payments. Given the problems in quantifying such premia, the authors refrained from inclusion.

7.4.3 Opportunity costs of cash holding: interest foregone

Estimating the opportunity costs of cash holdings may seem trivial only at first sight: simply multiply the pertinent amount of cash holding with the appropriate interest rate. It is however neither simple to determine the amount of cash holding in Germany, nor is it directly obvious what interest rate to select. After all, it has to be observed that only a fraction of cash holdings consists of transactions balances. A much bigger share serves hoarding purposes and is not used as direct means of payment. Another share is used in underground economy activities. This part will not be considered since the present study deals with the cost of legal payment transactions. Estimating the average amount of cash holding intended for transaction purposes will therefore be the first step.

Table 42 Interest cost of cash holding (only transaction balances)

	mn. EUR
Costs (assuming 2%)	251
Costs (assuming 10%)	1,254
20:80 (2% : 10%)	452
50:50 (2% : 10%)	**753**

Combined analysis of counter and ATM withdrawals with an assumed 80% share of active cash users results in 42 withdrawals per cash user per annum with an average amount of approximately EUR 280 per withdrawal. If the money withdrawn is spent - evenly distributed over the period considered - the average amount of cash holding corresponds to half the amount withdrawn, i.e. EUR 140. If a “residue” is regularly held in the consumer’s purse, the average amount of cash holding has to be increased accordingly. Assuming an average residue of EUR 50, the average amount of cash holding amounts to EUR 190.

Extrapolated to the active cash user, the total sum equals EUR 12.5 billion, corresponding to about 7% of the amount of money brought into circulation by the Bundesbank.[24]

Since the weighting of credit and debit interest rate optimisers are not known – as already seen above – the simple average has been calculated, resulting in opportunity costs for cash holding intended for payment transactions of about EUR 750 million.

8 COSTS OF CARDS

8.1 BANKS: CREDIT CARD

Credit card companies discern between the acquiring (or merchant) side and the issuing or card holder side. Banks can principally act on both sides of the market.

Table 43 Cost of a credit card transaction

	Costs per tx	Costs in %
Visa/MC fees	0.14	0.18%
Finance costs	0.09	0.12%
Running costs	1.10	1.41%
Tx-Processing	0.35	0.45%
Card	0.04	0.05%
Billing	0.14	0.18%
C-Service/Backoffice	0.44	0.56%
Application	0.12	0.15%
Fraud (€)	0.11	0.14%
Credit (€)	0.16	0.20%
Marketing	0.16	0.20%
Total	1.75	2.25%

[24] The low percentage rate is astonishing. Yet other studies have found similarly low values. E.g. see Seitz (1995) and Krueger (2000) or studies conducted in other countries (e.g. Porter and Bayer 1989 for the US).

In Germany, banks have mainly focussed on issuing. Acquiring and all related services are mostly performed by specialised service companies.[25] These services are taken into due account in the estimate of card costs for retail business.

Costs for the issuing side are mainly estimated based on the market information of PaySys Consultancy. PaySys estimates were validated by means of cost accounting of credit card issuing companies as well as by data – unfortunately incomplete – obtained in the survey.

PaySys estimates the average costs for a credit card transaction to EUR 1.75 (resp. 2.25%). This does not include costs for cash withdrawals or cost for additional services, e.g. insurance, bonus points or revolving credit. The individual cost components are detailed in table 43.

Total costs can be extrapolated on a value-per-transaction resp. %-of-turnover basis. They range between EUR 669 and 760 million. The simple average is used as estimated value.

Table 44 Issuing costs of credit cards

	Costs (mn. EUR)
Visa/MC fees	59.07
Finance costs	36.75
Running costs	445.39
Tx-Processing	143.50
Card	16.40
Billing	57.40
C-Service/Backoffice	180.40
Application	47.69
Fraud (€)	44.71
Credit (€)	63.87
Marketing	64.74
Total	714.54

8.2 BANKS: DEBIT CARDS

Costs for debit cards are not easily determined, since a debit card – as opposed to the credit card – is no independent product with own profit centre accounting. It is rather

[25] These service companies are often owned by banks.

part of the giro account package. This is why banks can provide hardly any data on the costs for debit cards.

Table 45 Costs of debit cards

in mn. EUR	ec cash	POZ	ELV	Total
Plastic	7.9	0.9	10.3	19.1
PIN	12.3	0.0	0.0	12.3
Chip	7.2	0.0	0.0	7.2
Authorisation	38.0	0.0	0.0	38.0
Blocking	4.0	1.6	0.0	5.6
Charge back	0.0	2.0	22.3	24.3
Address inquiry	0.0	1.8	19.8	21.6
Service	41.9	5.0	54.5	101.3
Overhead	15.9	1.6	14.3	31.8
Other	27.3	2.9	18.2	48.4
Total	**154.5**	**15.9**	**139.2**	**309.6**

Due to the a.m. facts, the costs have been estimated based on cost accounting for credit cards, including market knowledge of PaySys Consultancy and information obtained from the participating banks.

It has to be kept in mind that „Customer support and service" accounts for about one third of the costs, an important item often overlooked. Card payments, however, do require service staff – whether staff at the branch office or at a service centre - whom the card holder can address in case of problems.

8.3 RETAIL BUSINESS: CARDS

The retail sector's costs for cards amount to more than EUR 1.8 billion, corresponding to EUR 0.9 per transaction or 1.4% of the card turnover. The lion's share of these costs is caused by fees to be paid to the banking industry and estimated costs for cashiering. If these two items are deducted, the remaining sum amounts to almost EUR 600 million.

Table 46 Card costs for retailers

	Costs (mn. EUR)	per tx	in %
ELV	498	0.50 €	0.89%
ec Cash	524	0.69 €	1.11%
POZ	58	0.65 €	0.61%
Total Debit	1,080	0.59 €	0.95%
Credit	751	2.04 €	2.42%
Total cards	**1,682**	**0.90 €**	**1.39%**
Resource costs*	**559**	**0.39 €**	**0.62%**

*: without costs for cashiering (costs of cashiering process: EUR 430 Mio.)

8.3.1 Cost of cashiering process

The problem as to whether the costs incurred by the time required for making a payment has to be included also exists with regard to card payments. As in the case of cash, a partial inclusion seems appropriate. But once again, it is almost impossible to estimate the fraction of retailers for whom payment time matters.

Even though, the absolute costs of the cashiering process are not known for cash and cards, there is some information on the relative costs. The most recent surveys conducted by the EHI show that cash payments are generally processed faster than card payments. Including time costs for cashiering does increase the competitive advantage of cash with regard to costs. Yet it has to taken into account that the average cash payment involves smaller amounts than the average card payment.

Table 47 Cost of cashiering process

	Costs (mn. EUR)	per tx	in %
ELV	159	0.16 €	0.30%
ec Cash	182	0.24 €	0.39%
Credit	71	0.19 €	0.23%
POZ	18	0.20 €	0.14%
Total	**430**	**0.19 €**	**0.30%**

8.3.2 Financing costs

Conditions regarding value date of card transactions and interest rates pertinent for individual companies differ significantly. Big companies are generally capable to negotiate better conditions (faster clearance and value dating) and are able to refinance close to

market interest rates. Smaller companies have to wait longer for their money, in particular from credit card transactions and have to bear higher refinancing rates.

Table 48 Financing costs for card transactions

	Days	Volume	Tx (bn.)*	Ø vol. of finance (bn. EUR)	Costs of finance (mn. EUR)	Costs in %	Costs per tx
Debit	2	113	1,840	622	30	0.03%	0.016
Credit	7	31	367	596	28	0.09%	0.077
Total	3.1	145	2,207	1,218	**58**	0.04%	0.026

„days“: Days until value date, interest rate: 0.0475 (debit interest rate for non-financial corporations)

Since financing costs constitute a less important factor, the extrapolation was based on average values.

- average interest rate for non-financial corporations
- average period until value date of 7 days for credit cards and of 2 days for debit cards

Total financing costs amount to about EUR 58 million.

8.3.3 Risk costs

Losses mainly occur in direct debiting. The estimate on risk costs was based on the results of the survey and – in addition – published statistics on non-payments in direct debiting. Total damages (non-payment and handling expenses) amount to EUR 150 million.

Table 49 Risk costs of direct debiting

	Value	Comment
Write offs in 2004 (in %)	0.12%	EHI
ELV+POZ Volume 2004 (in mn. EUR)	66,396	PaySys
ELV+POZ tx 2004 (in mn. EUR)	1,079	
Write offs in 2004 (in mn. EUR)	82 €	
Handling costs (in mn. EUR)	68 €	derived form survey
Total risk costs (in mn. EUR)	**150 €**	
Total risk costs (in %)	**0.23%**	
Total risk costs (per transaction)	**0.14 €**	

8.3.4 Bank fees

Apart from specific product-based fees for ec cash, POZ and credit card payments, costs are also accrued per credit to a merchant's bank account (fees for return debits are booked as risk costs). The estimate of these fees is based on market data and interview results and amounts to EUR 748 million.

Table 50 Bank fees (without acquirer fees)

	ELV	ec cash	Credit	POZ	Total
Transaktions (mn.)	989	761	367	90	2,207
Volume (mn. EUR)	53,620	47,103	31,084	12,776	144,583
Fees	35 €	146 €	451 €	5 €	636 €
in € per tx	0.04 €	0.19 €	1.23 €	0.05 €	0.29 €
in % of volume	0.06%	0.31%	1.45%	0.04%	0.44%

8.3.5 Acquirer fees

Credit card acquiring in Germany is mainly performed by specialised companies. Though these are mainly owned by banks, the fees are not booked as bank fees but collected separately. The fees are only levied on credit card payments. The acquirer fee reflects expenses for transaction processing, payment guarantee, customer service, marketing etc.

Table 51 Acquirer fee in credit card business

	mn. EUR	per tx (EUR)	in %
Acquirer fee	112.5	0.31	0.36%

8.3.6 Network costs

Based on interview results and market data regarding turnover figures for the network operators, total costs were estimated at EUR 340 million. These include processing and handling, terminal costs and merchant service. An estimate of the costs for retailer-owned terminals was also conducted.

Table 52 Network operation cost

	Costs
Netzbetreiber (polling agent)	345 €
own terminals	24 €
Total	**369 €**
Transactions (mn.)	2,174
Sales (mn. EUR)	141,385
Costs/tx	0.17 €
Costs in %	0.26%

When allocating total costs on individual payment methods, the following per transaction cost were assumed: 10 Cent for ec cash, POZ and credit card and 5 Cent for ELV. The terminal costs were allocated to ec cash, POZ and credit card according to the respective share in transactions. ELV payments do not require separate payment terminals. The card reader is usually integrated with the cash register. Merchants could not provide a separate estimate on the respective costs.

Table 53 Allocation to payment methods

	ec cash	Credit	POZ	ELV
Tx (mn.)	761	367	90	989
Sales (bn. EUR)	47	31	13	54
Network costs (mn. EUR)	79	38	9	49
Terminal costs (mn. EUR)	75	36	9	73
Total costs	**154**	**74**	**18**	**122**
pro Tx	0.20	0.20	0.20	0.12
in %	0.33%	0.24%	0.14%	0.23%

8.3.7 Reconciliation

Reconciliation deals with costs for account reconciliation and control. Big companies have automated these processes to a large extent.

Table 54 Reconciliation costs

	Comment	Costs/tx	Costs (mn. EUR)
Debit	Sales < 100 mn. EUR	0.0259 €	23.8
	Sales > 100 mn. EUR	0.0039 €	3.6
	Total	0.0149 €	27.4
Credit	Sales < 100 mn. EUR	0.0259 €	4.8
	Sales > 100 mn. EUR	0.0039 €	0.7
	Total	0.0149 €	5.5
Total	Sales < 100 mn. EUR	0.0259 €	28.6
	Sales > 100 mn. EUR	0.0039 €	4.4
	Total	0.0149 €	32.9
	in %	0.023%	

8.3.8 Telecommunication

Big companies have connected their branch offices by means of leased lines in order to ensure continuous flow of ERP information. In this case, no further costs are incurred by payment transactions and communication costs can be neglected. Card acceptance, however, may be the reason why smaller companies decide on having a telephone extension, at all. This is why such cases require the allocation of both, fixed and variable costs, to card business.

Total communication costs are estimated to EUR 48 million.

Table 55 Total costs of telecommunication

	Value
Terminals 2002	900,000
Fraction of very small businesses	22.00%
Communication lines	198,000
Costs/line	192
Fixed costs communication (mn. EUR)	37.99

It is assumed that electronic payment transactions constitute the main reason why very small businesses (annual turnover < EUR 50,000) have a telephone extension. The costs for the extension are therefore allocated to payment transactions.

Table 56 Fixed costs of telecommunication

	Total	ec cash tx	Credit tx	POZ-tx	# daily cut offs*
Tx (mn.)	1,390	761	367	90	172
Fraction of companies<100 mn. EUR	0.5	0.5	0.5	0.5	0.5
Costs/tx	0.018	0.018	0.018	0.018	0.018
Total (mn. EUR)	12.51	6.85	3.31	0.81	1.54

Remark: only the first segment of USt has the telephone extension in order to enable payment transaction.

Variable costs are based on the assumption that companies with a turnover > EUR 100 million have a flatrate, resulting in marginal costs of nil.

Table 57 Variable costs of telecommunication

	Value
Costs of communication (mn. EUR)	50
per tx	0.02 €
in %	0.03%

*: Tm x days / number of checkout lines per company

Fixed costs are allocated to all four payment instruments depending on their share in total transactions. Variable costs are allocated to three payment instruments: ec cash, POZ and credit card.

Table 58 Allocation to payment instruments

	ec cash	Credit	POZ	ELV	Total
Tx	761	367	90	989	2,207
Volume	47,103	31,084	12,776	53,620	144,583
Direct costs	7	3	1	0	11
Share of total card tx	0.345	0.166	0.041	0.448	0
Contribution	11	5	1	15	33
Total costs	**18**	**9**	**2**	**15**	**44**
per tx	0.02	0.02	0.02	0.01	0.02
in %	0.04%	0.03%	0.02%	0.03%	0.03%

8.4 HOUSEHOLDS: CARDS

Costs for households are incurred by costs due to the cashiering process at the POS and by fees.

8.4.1 Cost of cashiering process

If the costs of the cashiering process have been included into the estimates conducted for retail, they should also be included in those for households. Assuming that opportunity time costs are about the same as in retail, the expenses for households come up to the same amount.

Table 59 Cost of cashiering process

	Costs (mn. EUR)	per tx	in %	Volume/tx
ELV	159	0.16 €	0.30%	54 €
ec Cash	182	0.24 €	0.39%	62 €
Credit	71	0.19 €	0.23%	88 €
POZ	18	0.20 €	0.14%	142 €
Total cards	**430**	**0.19 €**	**0.30%**	**66 €**
Cash	2,529	0.10 €	0.48%	20 €

8.4.2 Card fees

As a rule, debit cards do not incur separate costs. Yet it seems appropriate to regard part of giro account management charges as card fees. It is however unclear, how big this portion should be.

Since the implicit fee represents revenues for banking institutions, inclusion or not-inclusion does not influence the estimated amount of resource costs. Due to above reasons, there is no estimate on the implicit debit card fee.

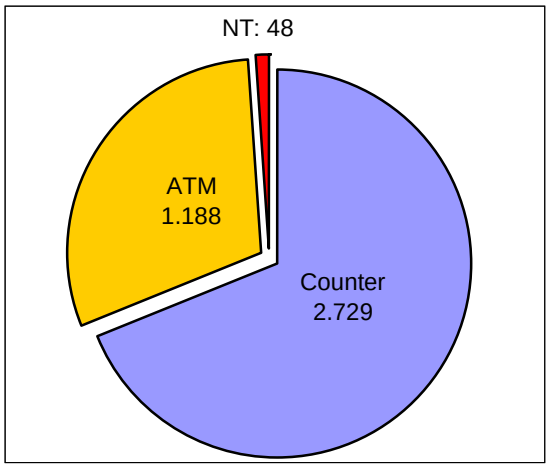
Credit card users incur costs of about EUR 20 per card, resulting in total expenses of EUR 426 million for all households. These costs will also be neutralised in the calculation of resource costs.

9 POTENTIAL SAVINGS IN TERMS OF CASH

9.1 BANKING SECTOR

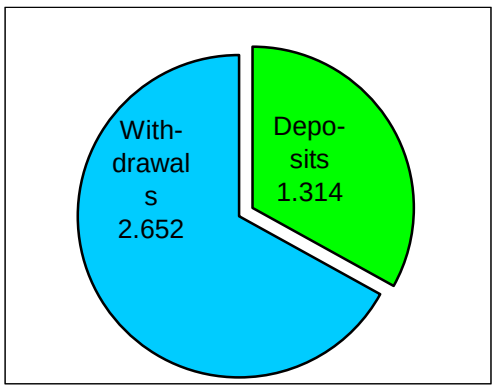
A closer look at the cost composition helps identifying the most relevant saving potentials. The graph below shows the allocation of costs to the three deposit resp. withdrawal channels, with the lion's share accounted for by counter transactions.

Figure 10 Cost of cash at ATM, counter and NT (night deposit) (in million EUR)



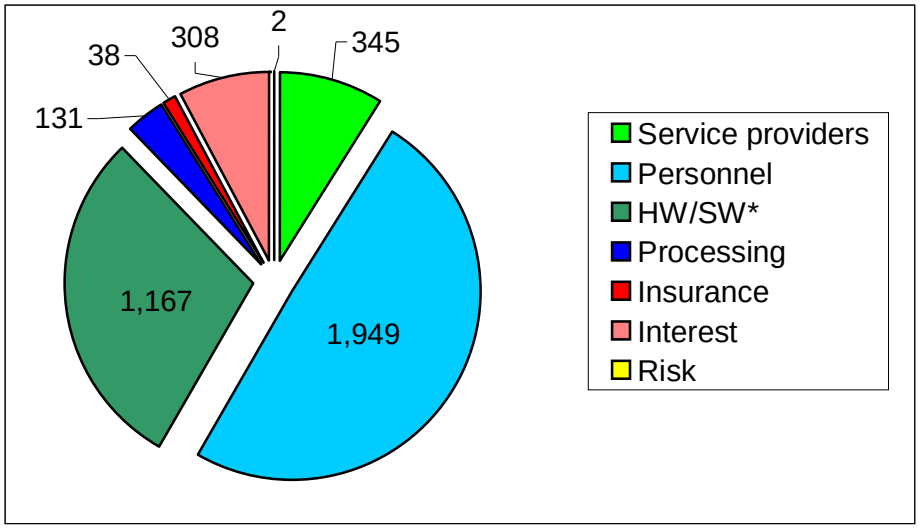
About 1/3 of the costs is accounted for by deposits and 2/3 are accounted for by withdrawals.

Figure 11 Allocation of costs to deposits and withdrawals (in million EUR)



A closer look at the cost categories reveals that personnel costs account for about 50% of the total costs. “Hardware“ (incl. buildings) and software account for just under 30%. About 10% of the costs are caused by employing external service companies and 8% are due to lost interests, a fact which is influenced by current interest rates being at a historically low level. Risk costs hardly matter at all.

Figure 12 Costs for cash allocated to cost categories (in million EUR)



*: incl. costs for buildings and safety facilities

The graphs show clearly that the most important cost component are personnel costs caused by counter transactions. These costs can be reduced by a shift to more efficient self-service transactions. Such a shift will constitute the most effective tool for reducing costs of cash handling.

Table 60 Costs per transaction at the counter and at the ATM

	Counter	ATM
Costs per deposit tx	3.68 €	--
Costs per withdrawal tx	3.68 €	0.50 €

There are however a lot of alternatives. The currently rather small share of expenses for external service companies shows that banks are not fully capitalising on potential savings offered by outsourcing. Furthermore, some indicators suggest that the performance of banks offers potential for further improvement in terms of efficiency. Another approach

for realising potential savings can be located in the general business conditions, including: cash inventories of banks not credited against required minimum reserves and the regulations for verification of currency by the Bundesbank.

The above discussion provides three approaches for reducing costs:

- reduction of counter transactions
- process optimisation
- changing the general business rules

9.1.1 Reduction of counter transactions

Before estimating potential savings to be realised by reducing counter transactions, the following questions have to be answered:

- How large is the share of counter transactions that can be migrated to ATMs?
- Will the ATM-network have to be expanded?
- What are the effects on variable costs?

Substituting counter transactions resp. in general substituting staff-operated machines by customer-operated automats has certain limits. Risk reduction requires limited maximum withdrawals for self-service terminals. Whenever an amount exceeds the maximum, the customer has to go to the counter or address the customer consultant who will authorise a higher self-service transaction. Another matter to be considered is the fact that even simple self-service systems may exceed the cognitive capabilities and capacities (for example, remembering the PIN) of part of the population, a problem faced mostly, but not exclusively, by senior citizens. The limit for the substitution of counter transactions is hard to predict from today's point of view. A reduction in volume of 50% seems realistic in the end. As such substitution will primarily affect smaller amounts, the reduction regarding the number of transactions would be more significant. For the purpose of the following sample calculation, a reduction in counter transactions by 75 % was assumed.

Turnovers as well as counter and ATM transactions shown in the table below have been calculated based on the above assumptions.

The value of ATM withdrawals would increase by two thirds, whereas the number of transactions would grow by only 13 %.

Table 61 Scenario with reduced counter transaction volume

	EUR (bn.)	Tx (mn.)	EUR/tx
Counter before	460	425	1,081
Counter after	230	106	2,163
Migrated to ATM	230	319	721
ATM before	340	2,399	142
ATM after	570	2,718	210
Increase ATM (%)	67.65%	13.30%	47.89%

A growing number of ATM transactions will possibly require expanding the ATM infrastructure, though this is not mandatory since the average utilisation of ATMs still provides capacities for more frequent use. An ATM currently processes an average of 45,000 transactions. ATMs in big cities frequently manage twice as many transactions. A reduction of counters would not necessarily require the installation of more machines. Current infrastructure would simply have to be used more intensively. Savings in counter costs would not be confronted by additional costs in the "hardware/software" category. Only such ATM-costs would increase that are caused in relation to transaction value respectively the number of transactions.

Table 62 Cost reductions due to reduced volume of counter transactions

	Current costs of counter tx (mn. EUR)	Current costs of ATM tx (mn. EUR)	Decrease of counter tx: Implications for total costs
Service providers (CITs, ...)	141	160	Cost shifting
Personnel	1,593	354	Reduction at the counter
HW/SW (incl. rent)	813	395	Reduction at the counter
Processing ATM	0	131	Increase at ATM
Insurance	14	24	Cost shifting
Interest	168	124	Cost shifting
Counterfeiting	2	0	Applies to deposits
Total	2,729	1,188	Reduction of costs

As regards variable costs, they are mainly shifted while no reliable prognosis can be made as to if and to what extent this shift will lead to further cost savings.

The most substantial savings are achieved in terms of counter staff and the very counter itself (safety facilities, space for workstation, etc.). A reduction in transactions by 75% and in withdrawal sums by 50% seems to allow a reduction in staff by 50%. To what extent counter jobs will be cut, mainly depends on the policy of the banks. A reduction by at least 1/3 seems probable with regard to the supposed drastic reduction in volume. Since counter transactions are spread quite evenly on withdrawals and deposits, the potential savings amount to EUR 370 million in personnel costs and EUR 120 million in counter hardware, resulting in total savings of almost EUR 500 million, corresponding to 13% of the total cost of cash.

Similar savings can probably be achieved with respect to the system of depositing cash. The scope of the present study did however not allow establishing the costs per transaction incurred at cash deposit machines or recycling systems.

Assuming the same potential savings for deposits as for withdrawals, merely shifting part of the counter transactions to self-service terminals will reduce cost of cash by almost EUR 1 billion, a value that corresponds to about 25% of the total cost of cash. Assuming even higher achievements in reducing counter transactions, the effect on overall savings will increase accordingly.

9.1.2 Process optimisation

The great bulk of personnel costs is not only incurred by personnel costs due to counter activities. Processing and cash disposition as well as replenishing and emptying ATMs is mainly performed by bank staff. Outsourcing these processes to specialised service companies can significantly reduce costs. The data collected for this project do not provide sufficient basis for an estimate of potential savings.

9.1.3 Crediting of cash holding against minimum reserve

Since cash holdings (incl. cash in ATMs) can no longer be credited against the minimum reserve, maintaining cash holdings incurs costs for banks. It is however the European Cen-

tral Bank who benefits from this regulation and the interest to be paid by banks does not constitute resource costs in this respect. Lost interests yet are considered as costs and thus work as incentive for banks to restrict cash holdings to a minimum. They are forced to optimise replenishing costs and cash holding costs, with the effect that positive cash holding costs drive banks to diminish the average amount of cash holdings. Reduced cash holdings, in turn, requires more frequent replenishing of ATMs and cash boxes compared to a situation with cash holding costs almost nil. Not being able to credit cash holdings against minimum reserve results in resource costs caused by additional trips for replenishing ATMs and branch offices. A simple model calculation illustrates the effects of re-introducing the possibility of crediting cash holdings against the minimum reserve.

Table 63 Cash management model for the average ATM

Cash Management Model	Benchmark	Scenario1	Scenario2
Ø-Withdrawal (EUR)	142	142	142
Number of withdrawals	45,606	45,606	45,606
Volume of withdrawals p.a. (EUR)	6,469,056	6,469,056	6,469,056
Residue	40,000	40,000	80,000
Interest costs (in %)	3.00%	0.00%	0.00%
Insurance / risk	0.005	0.005	0.005
Costs per filling (incl. transport)	75	75	75
Optimal filling amount (EUR)	166,507	440,536	440,536
Optimale number of fillings p.a.	39	15	15
Average balance per ATM (EUR)	103,253	240,268	260,268
Daily withdrawals (EUR)	17,723	17,723	17,723
Period between fillings (days)	9	25	25
Costs of filling p.a. (incl. transport)	2,914	1,101	1,101
Interest costs p.a. (EUR)	3,098	0	0
Costs of insurance/risk (EUR)	516	1,201	1,301
Resource costs (EUR)	3,430	2,303	2,403
Change of resource costs (%)	0	-33%	-30%
Change of resource costs (EUR)	0	-1,127	-1,027
Total costs for banks (EUR)	6,528	2,303	2,403
Change of bank costs (%)	0	-65%	-63%
Costs per tx (EUR)	0.14	0.05	0.05
Costs in %	0.10%	0.04%	0.04%

Scenario 1: Reduction of interest costs to nil (crediting against the minimum reserve)
Scenario 2: as scenario 1 and additionally doubled residue.

The assumption includes a change in cash holding costs from 3.5% (3% interest costs and 0.5% risk costs) to 0.5%. The remaining costs represent mainly risk costs (insurance, theft). A reduction of such extent will result in increasing the optimum replenishing amount for the

average ATM from EUR 166,000 to EUR 440,000. Simultaneously, the number of annual replenishing processes will decline from 39 to 15, reducing replenishing costs from EUR 2,900 to only EUR 1,100. On the other hand, risk costs will increase from EUR 516 to EUR 1,200 due to the increased average sum inside the ATM. On the whole, the result is a significant reduction of resource costs (not considering the reduced interest costs because they are set against reduced revenues of the Central Banks).

An extrapolation for the entire ATM stock yields savings of EUR 220 million for the banking industry and EUR 59 million for the national economy. If banks increased the residue, the cost reduction would be slightly lower.

Potential savings will of course gain in volume in proportion to a rising interest rate. An interest rate of 8% will result in a EUR 137 million cost reduction. Or – in other words – with an assumed interest rate of 8%, the economic damage amounts to 137 million EUR because cash holdings cannot be credited against the minimum reserve.

Table 64 Crediting cash balances against minimum reserve: economic savings

	Benchmark	Scenario1	Scenario2
Bank costs	343	121	126
Resource costs	180	121	126
Cost saving		59	54

in million EUR

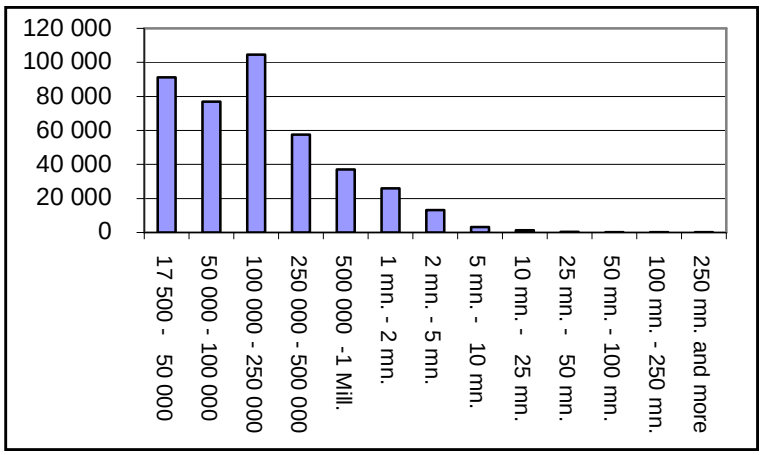
9.2 RETAIL BUSINESS

Since retail businesses are extremely heterogeneous, potential savings are difficult to estimate. Taking a closer look reveals that small companies dominate.

The two lowest turnover classes (EUR 17,500 up to EUR 100,000 per annum) account for more than 40% of the companies. If the next group (EUR 100,000 to 250,000) is included, their share amounts to 66%. A better interpretation of these figures will be possible when turnovers per month and margins are included in the considerations.

The three lowest turnover categories have an average annual turnover of EUR 32,080, EUR 72,654 resp. EUR 161,742. This corresponds to a monthly turnover of EUR 2,673, EUR 6,055 resp. EUR 13,479. Even with an assumed margin of 50%, only EUR 1,337, EUR 3,027 resp. EUR 6,739 remain for covering personnel costs, rent etc. Business will only pay off - in particular for the two lowest categories – if the owner and members of the family work for the company. The employer's salary will often remain below market standards for employees, indicating that in these categories the inclination will be strong to attend to as many tasks as possible themselves.

Figure 13 Retailing in the narrow sense: number of tax payers depending on company size



Turnovers: excl. VAT
Source: Federal Statistical Office

The small number of transactions probably also indicates a rather minor inclination to implement procedures incurring intensive fix costs. A retailer with a monthly turnover of EUR 2,763 (lowest turnover category) will process a total of 134 transactions, assuming an average sales slip of EUR 20. If this retailer accepted card payments, and the payments accounted for an (over average) share of 40%, the number of transactions per months would amount to 52. With a network operator fee of EUR 30 per month, the retailer would have to face fixed costs of more than 50 Cent per transaction (resp. more than 2.5% of the turnover) only for network service.

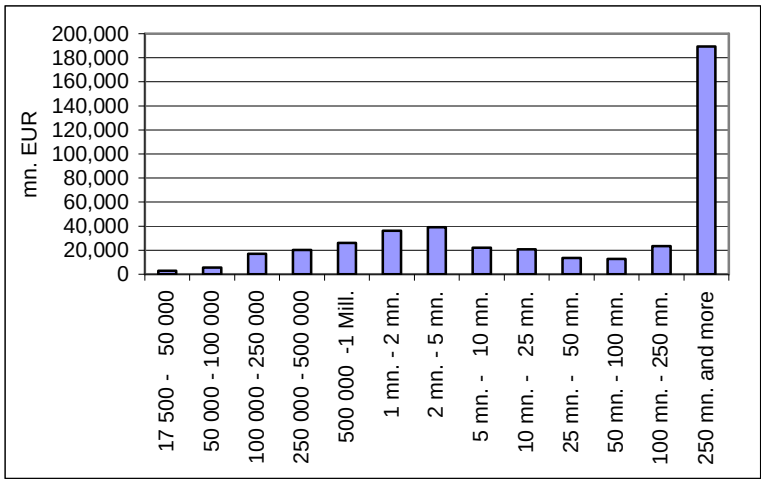
Table 65 Model calculation: turnover and margin in the lower turnover categories

Sales class (sales p.a. in EUR)	Ø	per month	Margin 50%*
17 500 - 50 000	32,080	2,673	1,337
50 000 - 100 000	72,654	6,055	3,027
100 000 - 250 000	161,742	13,479	6,739

*: assumption
Turnovers: excl. VAT. "margin": turnover minus cost of sales
Source: Federal Statistical Office and own calculations

The above sample calculation demonstrates that relatively low fixed costs will cause relatively high costs per transaction for companies with rather small turnovers. The example given above and the probably low-revenue situation of business owners indicate that the lower categories will rather not implement procedural changes, when latter will result in higher pecuniary costs, whether fixed or variable.

Figure 14 Turnover in retail business depending on company size



Source: Federal Statistical Office and own calculations

The situation of big companies is totally different. They have already introduced hardware into their back offices and service companies for currency collection on a large scale. The present study, however, provides no basis for establishing facts as to what extent the overall sector still has potentials for a more intense utilisation of verification and counting equipment or CIT services.

A current development in retail business will probably affect the costs of cashiering as a whole: the introduction of self-checkout systems. Self-checkout systems reduce costs of

retailers incurred by entering prices and payment transactions. This method does not only offer potential savings for cash payments but also for card payments.

Self-checkout systems entail higher fixed costs than standard check-out lines. This is why their introduction only makes sense for places with many transactions. This fact already limits their range of application. Moreover, the systems cannot substitute all sales staff. Personnel will still be needed at the check-out lines to control or assist in case of problems. Yet, overall personnel costs per check-out line will decline significantly. This will also reduce the costs of payments transaction – of cash and of card payments.

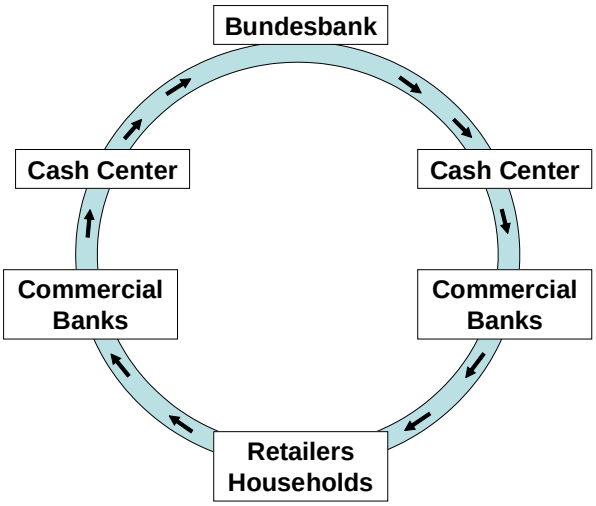
As for cash, self-checkout requires the installation of automated systems dispensing change. These systems cause additional fixed costs. Yet they offer a chance for reducing the cost of cash disposal by optimising the return of coins to the effect that no coins have to be added to or removed from the system (for longer periods of time). If accomplished, the above feature would result in significant savings with regard to coin disposal.

Potential savings for retailers are hard to put in numbers since too many unknown factors are in the game, e.g. the number of branch offices per company, turnover and transactions per branch office, geographical distribution of branches, cash payments rate, value of average sales slip, etc.

9.3 SHORTENING THE CASH CYCLE

One factor influencing the cost of cash is the number of stations in the cash cycle. The more stations are passed, the higher the transport and coordination costs incurred and the higher the probability that processes will be replicated.

Figure 15 Circulation of cash: maximum length



The maximum length cash can travel is as follows: Cash that was initially verified by the Bundesbank is transported to cash centres where it is portioned for branch offices and ATMs. Then it travels to private banks (branches and ATMs), from where it is dispensed to households and retail businesses. Households and retailers will in return deposit it into banks. The banks will have it transported to cash centres where it is verified and sorted and forwarded to the Bundesbank.

Since certain "short cuts" are currently available, only about one third of the banknotes passes through the complete cycle.[26] This is why the average cycle is shorter.

Short cuts can be accomplished by the following possibilities:

- direct supply of retail by security transport companies without private banks (accordingly in terms of cash disposal)
- direct re-issuing of cash at the branch offices (recycling)
- return of cash directly from cash centre to bank – without Bundesbank (only possible for cash to be paid out at the counter).

Retailers increasingly using service companies may lead to further shortening the average cycle. On the other hand, the average cycle length rather is extended due to cash with-

[26] Estimates based on a simple cash flow model.

drawals being shifted from counter to ATM, since ATMs generally solely dispense cash previously verified by the Bundesbank.

The following paragraphs present three approaches that will result in a reduction of the cash cycle:

- shifting verification to commercial cash centres
- recycling of cash deposits by recycling machines
- cash paid out at the cash register
- ATMs replenished by merchants

9.3.1 Verification of bank notes in private cash centres

Cash verification at private cash centres instead of having it transported to the Bundesbank for verification would reduce transportation costs significantly. Due to a regulation - effective until recently – stating that ATMS can only be replenished with cash previously verified by the Bundesbank, such plans were limited by state legislature.

The European Central Bank, however, has extended the possibilities available to banks for cash dispense in two steps. The "Terms of Reference" adopted in 2002 allow banks to use so-called „recyclers“ (see paragraph 9.3.2). As a second step, they have adopted a frame of action providing the permission for private enterprises for cash verification if they use equipment that fulfils the criteria specified by the ECB. Apart from technical specifications, companies that undertake cash verification have to fulfil extensive reporting requirements. Any cash verified by these companies can also be used for replenishing ATMs.

The above reform does not necessarily reduce the actual costs of verification. Perhaps decentralisation will even reduce economies of scale. However, locating verification procedures closer to the customer enables savings on travel expenses. In addition, the verification can be offered as package including other services (portioning, replenishing/emptying cassettes, etc.).

If and to what extent savings can be realised cannot be determined on the sole basis of survey data collected.

9.3.2 Recycling by banks

In 2002, the ECB adopted a regulation allowing the use of so-called recyclers. These machines accept and dispense cash while the cash deposited in the machine is automatically verified in terms of genuineness and fitness. Cash classified as genuine and fit can be dispensed directly without detour via the national Central Bank. Prerequisite is that the recycler complies with the requirements put up by the ECB. The banking is currently starting to install the first recyclers.

The utilisation of recyclers can reduce resource costs if savings on replenishment costs are bigger than the additional expenses for hardware and the more expensive maintenance service. This should mainly apply for locations with high transaction numbers. An estimate on the extent of these savings cannot be realised on the basis of the present data.

9.3.3 Recycling by retail

- Cash-back

Cash-back means that the customer gets the cash at the cash register. A customer using a card can increase the amount due for his purchase by a certain amount and have the difference paid out in cash. This procedure has only been introduced in Germany since the end of 2003 and has not spread very far until now. There are, however, a couple of countries, e.g. Australia, the UK, the Netherlands, Norway and the United States where cash-back has achieved quite an impressive volume.

Customers benefit from cash-back since first of all, the number of locations where they can withdraw cash is increased, and secondly, two separate tasks (shopping and cash acquirement) can be dealt with in only one transaction.

Yet not only would the customers benefit but also the merchants, since their cash registers are not full of cash that has to be counted and deposited at the bank. But cash-back can also increase complexity of cash management and cause merchants to augment their

cash holding, thus increasing interest and risk costs. Depending on the fee structure of the individual cards, they may face higher fees. Germany's ad valorem fee of 0.3% for ec cash will have such an effect. If the fee per transaction is fixed – e.g. as in the Netherlands – then cash-back will not incur additional fees.

From an economic point of view, the balance shows a shortening of the average cash cycle on the credit side and an increased risk of counterfeited banknotes on the debit side, since money paid out at the cash register cannot be verified as thoroughly as that issued at the counter or the ATM.

- ATMs replenished by merchants

A couple of countries (e.g. the UK, the Unites States, and Ireland) have allowed private service companies to set up ATMs in addition to those installed by banks. They often co-operate with retailers. The merchant provides the space for installation and performs the task of replenishing the ATMs with cash money from the cash register. The ATM is usually emptied after closing time and the money is deposited safely together with the other cash.

This model is suited for reducing costs in several aspects:

- no service companies required for replenishing
- machines are cheaper (diminished safety requirements due to rather low sums in this type of ATM)
- part of the maintenance tasks to be taken over by merchant

The Eurozone, however, requires customer-operated cash dispensers only to be replenished with cash that was verified in accordance to ECB criteria. These demand that the retailer has to verify the money before putting it in the ATM by means of equipment of a type that has previously been tested and listed by a Central Bank belonging to the Eu-

rosystem. For the time being, it can be doubted whether it will be possible to offer the pertinent equipment at prices that will allow realisation of the merchant-replenished ATM. [27]

From an economic point of view, a wider use of the model might entail cost savings, if expensive ATMs operated by banks were removed. But even if this was not the case eventually, the positive effect of increased customer convenience would remain because of a more comfortable access to cash.

10 REDUCTION OF RESOURCE COSTS BY SUBSTITUTION OF CASH PAYMENTS?

Though the results of the present and of other studies show that cash is the cheapest payment instrument on an average level, an increased use of cash will not necessarily entail cost savings. On the contrary, it is often pointed out that though average costs of cash are below those for cards, cards have smaller marginal costs. The hypothesis is based on the idea that card payments require an infrastructure, which constitutes essentially fixed costs. Once the infrastructure has been built, transactions can be processed at marginal costs close to nil. The general assumption for cash payments states essentially variable costs, resulting in the conclusion that the substitution of cash payments would incur almost no additional costs, with costs for cash payments decreasing on the other hand.

The De Nederlandsche Bank tried to distinguish between fixed and variable costs in their estimate and indeed found out that the marginal costs of a debit card are much lower than the marginal costs of a cash payment.[28]

Unfortunately, the allocation of costs as to being variable or fixed could not be retraced in spite of the elaborate annex, rendering validation of data impossible in the end. Yet the general public discussion seems to somehow misinterpret the costs of card payments.

[27] In Germany, the approach is facing the additional problem that a model in which merchants replenish the ATMS with their own money, requires a permission from the German banking supervisers (BaFin).

A card payment that passes smoothly is most certainly very cheap in processing. Technical processing, however, is not all there is to card payment systems. Comprehensive service is a prerequisite for card payments. Changes in customers' master data must be registered and entered, information must be provided and complaints answered. Customers must be provided with an opportunity to indicate card loss and to cancel it by phone, etc. etc. A closer look at the costs of the banking industry with regard to ec cash payments, direct debit and credit card payments reveals that the future will bring a certain decline in costs, though not as enormous as is frequently assumed.

The calculation on behalf of the retailers does not yield definite results either. Terminal costs per transaction most certainly will decline with more transactions performed at the terminal, but from an overall economic point of view it may also induce small retailers with rather few transactions to have terminals installed. The extreme case would result in a reduction in the average number of transactions per terminal.

Table 66 Cost structure of ec cash payment

Type of costs	Share	Comment
Plastic	5%	Increased card use leads to more card losses/damages (because cards are used more intensively or because customers with lower card affiniy start using cards)
PIN	8%	
Chip	5%	
Authorisation	25%	Increased activity leads to higher costs (less than proportiona
Blocking	3%	
Service	27%	Rising costs of service
Overhead	10%	A larger share is allocated to the product "cards"
Other	18%	Small increase

Table 67 Cost structure of credit card payment

[28] Marginal costs are even smaller when payment is effected by means of an e-purse.

Type of costs	Share	Comment
Visa/MC fees	8%	Rising costs
Finance costs	5%	Proportionally rising costs
Tx-Processing	20%	Higher costs (less than proportional)
Plastic	2%	Increased card use leads to more card losses/damages
Billing	8%	Higher costs (less than proportional)
Service/Backoffice	25%	Rising costs of service
Application	7%	Higher costs (less than proportional)
Fraud risk	6%	Rising costs
Credit risk	9%	Rising costs
Marketing	9%	Rising costs

Table 68 Cost structure of direct debit payment

Type of costs	Share	Comment
Plastic	7%	Increased card use leads to more card losses/damages
Charge backs	16%	Increased activity leads to higher charge backs
Address inquiry	14%	
Service	39%	Rising costs of service
Overhead	10%	A larger share is allocated to the product "cards"
Other	13%	Small increase

Though an estimate on marginal costs based on the available data is impossible, the assumption of a significant reduction of transaction costs seems rather improbable for the time being. In other words: with transaction numbers totalling 2.2 billion in terms of card payments, the largest share in economies of scale has already been realised.

Assumptions on the cost of cash may also be doubted. No one disputes the manifold manual interventions that become necessary depending on the volume of payment activities: transportation of cash to the bank's or the retailer's branch office or the ATM, paying out cash at the branch office, counting cash at the retailer's branch office. But many of the costs mentioned include a share of fixed costs, e.g. transportation costs incurred in retail are mainly determined by the number of transports and much less by the value of the money transported. As long as cash remains so widely used that disposal is required on a daily basis, a reduction of cash use will only imply a negligible reduction of cost.

Therefore, the assumption of enhanced card usage resulting in significantly lower economic costs has to be met with healthy scepticism.

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Appendix

Resource costs incl. cost of the cashiering process

Facing considerable uncertainties in the estimation of costs for cashiering, the present study only uses estimates that do not include such costs. Omitting the cost of the cashiering process reduces estimated resource costs. The relative amount of costs, however, is not much affected, since cash payment is the fastest payment method in Germany.

Estimates on the costs for cashiering have been based on data collected by the EHI on how much time is required for a POS payment transaction. The standard times were assessed with a standard hourly rate and multiplied with the number of transactions. The value obtained must be considered as the upper limit, for many retailers do not consider the time required for POS payments as costs, since their personnel costs are not influenced by these costs. A similar attitude can be observed in customers, since not every customer perceives the time required for making a payment as costs in any given purchasing situation. The actual costs with regard to the time required for making a payment should therefore be much lower. Yet there is no plausible method to be applied for calculating the respective discount. This is why the present appendix merely details an estimate of the maximum costs.

Table A1: Resource costs incl. costs for cashiering time

	Costs (mn. EUR)	EUR per tx	in % of sales	in % of GDP	EUR per capita
Cash	13,964	0.37	1.86%	0.64%	169
Debit	1,531	0.83	1.35%	0.07%	19
Credit	1,058	2.71	3.07%	0.05%	13
Total	16,553	0.42	1.84%	0.76%	201

Table A2: Allocation of resource costs (incl. costs for cashiering time) to individual sectors

	Cash (mn. EUR)	Debit (mn. EUR)	Credit (mn. EUR)	Total (mn. EUR)
Retailers	5,723	866	272	6,860
Banks	3,982	307	715	5,003
Households	3,371	358	71	3,800
Bundesbank	889	0	0	889
Total	13,964	1,531	1,058	16,553